Winning the Electric Cooking Load—*Export Trade for Electrical Manufacturers and Jobbers together with other articles dealing with the various phases of commercial work and operating practice*

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Electrical World

New York, November 25, 1916 McGraw Publishing Co. Inc. Vol. 68, No. 22 10c a copy

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Loads Increase with Coal Shortage

NEW high records in industrial power business are causing some anxiety among central station executives. The great growth in load, due to the tremendous activity in all industries, has already taxed the capacity of some properties. Lately there has been a further increase as a result of coal shortage. Industries which were caught short of coal are coming to central stations for energy. As the additional business thus presented is superimposed upon a load which already surmounted all records, it brings a problem. The question of how long this extra demand will remain depends upon how long the coal shortage lasts. In this situation the central station industry has a suggestion for the future which is now receiving consideration around the council tables. If coal shortage continues to be imminent and the industrial power demand remains large it will be necessary for central stations to keep an even larger supply of coal than they ordinarily do. It is difficult to decide how far in advance a company is justified in anticipating growing demand in these extraordinary times. But whatever the decision is as to apparatus, the risk in having an abundant coal supply is not serious. It is measured, even on purchases in the open market, by the difference between present coal prices and normal coal prices. And the parable of the wise and foolish virgins may be recalled, when it is too late, by the officials, who, having the opportunity, failed to avail themselves of it.

Wasting Capital

TWO blades of grass, growing where one grew before, furnish a homely illustration with an antithesis. Two central stations, having only the market for their product which one of them had before the other started in competition, represent plain economic waste. Public service commissions, composed generally of men of ability, intelligence and integrity, have taught the public that it is sheer folly to permit a new corporation to enter a territory already well served by an existing public utility company. In many instances when corporate capital lacked the wisdom to heed this established principle the commission kept it from following its contemplated foolish course. It remains for municipal capital to disregard the lessons of the past, to ride roughshod over the teachings of the commissions. Cleveland has voted to enlarge the municipal plant with which it is engaged in duplicating the service of private capital in certain sections of the city. And a committee of engineers reports that Los Angeles can make money by paralleling existing private distribution lines. Fortunately in the latter case the Mayor of the city does not hesitate to declare that such a proposition means economic waste. The law provides orderly processes for municipalities whose people believe that the rates charged by a private utility are too high. The defiance of the orderly process of law is not any more becoming in a municipality than in a corporation.

Human Engineering

THAT labor and capital must arrive at a better understanding of the needs of each for the other, is a threadbare statement. The electrical manufacturer faces once more this universal problem of all industry. War profits and war wages have demoralized the labor market. Back of this immediate condition is a long history of conflicts and misunderstandings. Without rehearsing in detail, it may be said that to-day the philosophy of the wage relation between capital and labor boils down to this statement—labor demands the most for the least effort and capital gives the least for the least effort. Not only are unit labor costs gradually mounting, but overhead manufacturing costs have increased because of the raising of the standards of working conditions. Better lighting, better sanitation, fire and accident prevention laws all are necessary, but they demand extra expenditures by the manufacturer which are often overlooked by the public. The immediate burden of these extra expenditures falls on capital although in the long run the added cost is passed along the economic chain to the consumer.

What can be done to arrive at a better solution of the problem of capital and labor? A movement in the right direction, assuming that the constructive program laid down is carried out, is the formation of a national industrial conference board to which attention was called in our news columns last week. Representatives of various manufacturers' associations including the electrical divisions have formed a co-operative body to analyze the relations between labor and capital. There is no greater opportunity for constructive industrial statemanship than that given this newly formed commission. There are two sides to the problem which the commission is undertaking to solve. Labor has fallen short of its opportunity in the past. So has capital. One party in the combination must be big enough to see the questions involved with a sympathetic understanding of the other man's side. Never was there a time when this country needed constructive leadership in the problems involving capital and labor more than now. The new commission has the opportunity to see both sides and

to realize the importance of both sides. Managers need training as much as men. The limitation of output, which is the stumbling block of unionism in the minds of thinking men, has a twin companion in the limitation of incentive imposed by capital.

The newly formed commission reiterates in its published statement of purpose the need for a better understanding of facts. Fact-gathering is the province of the engineer. Engineering has solved the physical factors in manufacturing, equipment, raw materials and machinery. May it not embrace also the human factor and become an even greater element in social progress?

Glare from Headlights

GLARE has perhaps been best defined as light out of place and its existence is fairly obvious to the victim while he may not be able to give any accurate account of how and why. The brief paper read by Mr. Replogle before the Detroit Section of Automobile Engineers represents at least an honest effort at trying to obtain some quantitative idea of what constitutes glare, using in this case the word in the sense of such an excess of superfluous light as prevents proper vision of things which one wishes to see. To this end Mr. Replogle measures the illumination reaching the eye at an arbitrary distance from an automobile headlight, and also that which reaches the roadway also at an arbitrary point with reference to the headlight. Under certain assumed conditions he finds a fairly constant ratio necessary to enable the roadway to be distinguished in the presence of glare. This does not give any precise unit in which to measure glare, particularly since there is some doubt as to whether the light on the road should be the total at the point or merely that received from the perhaps glaring headlight at the same point. Nevertheless at least a tentative working ratio is an exceedingly useful thing to have obtained in its bearing on the general subject.

The laws regarding automobile headlights in various states and cities are so horribly mixed up, unscientific and unenforceable that they are of very little use. Therefore all the technical information that can be obtained on the subject is none too much for a basis of codification which shall compel rapidly-moving vehicles to keep their light on the road where it belongs instead of shooting it into the eyes of driver or pedestrian. A good deal of experimenting will doubtless be necessary to coordinate the scientific facts with the practical requirements which could be embodied in the statute. Mr. Replogle's preliminary suggestion, for example, would let pass unchallenged perhaps the most dangerous form of headlight which could be imagined, that which is focussed a short distance in front of the car so as just to escape the height limit and thereafter spreads in a blinding blaze. A good deal more than any ratio of illumination expressing glare is necessary to get the light safe both for the driver and his fellow users of the highway.

The Electric Cooking Load

CENTRAL station managers are now coming fully to realize that the cooking and auxiliary heating load is one which must now be taken very seriously, and developed as earnestly as the incandescent lamp business was pushed years ago. The cooking field is the biggest undeveloped one in sight with the richest promise of rewards to the assiduous cultivator. The report from Mr. Kennedy of the Southern California Edison Company is very much to the point and deserves careful study on the part of the salesman of electrical supplies. It puts the case in a remarkably clear light and the facts are derived from experience in a territory where there is particularly good opportunity to push the cooking load. The minor cooking appliances are innumerable and widely used. They add nothing to the problems of central station distribution and a comparatively small amount to its load and profits. So far as they utilize energy they are good and profitable, and their convenience advertises itself. The domestic cooking development is more recent and requires far greater care in its development with the promise, however, of very large returns in increased output.

The difficulties in the way of introduction have been in the past three in number; first, the unfamiliarity of the public with the peculiarly valuable qualities of electric heating for coking purposes; second, the cost of energy; and third, and by no means least, the cost of the apparatus itself. As regards the first count the success of electric cooking depends largely on its precisely reproducible results and its high efficiency. The ordinary coal range is a rough and tumble affair, enormously inefficient, and not easy so to run as to produce uniformly excellent results. Its lack of proper utilization of the heat, and the general dirtiness resulting from the combustion of fuel, have made it in the past a necessary nuisance, now become unnecessary for cooking at least. The first inroads upon its field were made by the gas range, which removed the dirt nuisance quite completely, gave much greater ease of regulation and slightly higher efficiency, leaving in this respect, however, very much to be desired. The chief difficulties associated with it were the ease with which gas could be wasted, the cost and inconvenience of securing a steady supply of hot water, automatically furnished by the inefficient coal range, and the production of large quantities of water vapor from the open burning of the gas, which required very good ventilation to avoid being a nuisance.

The electric range has a vastly higher efficiency of utilization owing to more scientific construction than has the gas range or coal range. The heat is very definite and easily regulated. Consequently, results can be obtained with some degree of uniformity, and finally it gives rise to no water vapor and makes it very much easier to ventilate the kitchen. Indeed with a suitable equipment of utensils one can boil the cabbage or fry onions on the back stoop. With its higher efficiency and greater ease of utilization comes a certain requirement for a different kind of intelligence than that necessary to regulate a coal oven. Every range installed,

however, is an educator, and this difficulty very rapidly breaks down under a small degree of familiarity. The cost of energy has now been reduced in most localities so that the total expense of operation is within modest limits, thanks to high thermal efficiency. The hot water problem is less troublesome than it was, and entirely vanishes in apartment houses where continuous hot water supply is available.

Finally, as to the cost of the apparatus itself. This needs considerable reformation. It has been brought down to a better point than ever before, but in our judgment the electric range makers have made a blunder in copying the familiar gas and coal range types in building their apparatus. The result is that the purchaser has to pay for some hundredweight of often too elaborately molded cast iron, which does no possible good. A set of utensils including an oven, on a soapstone or other non-conducting slab will do anything that the most elaborate range can do and quite as efficiently. When the range as a whole is built, not with reference to that which it should supersede, but so as to obtain the highest efficiency for the cooking appliances at the lowest total cost, the difficulty of installation price will be very much diminished. As regards the character of the load from the standpoint of the central station Mr. Kennedy's observations are much to the point. Experience has shown in his territory and elsewhere that a very large part of the cooking load is off the peak. The diversity factor in cooking apparatus is extremely large and in not a few places it has been found that the effect on the peak is quite negligible. From the central station standpoint the chief difficulty of taking on electric range service is in the costs of installation, the requirement for copper being, for the necessary amount of regulation, far in excess of anything with which stations have been familiar in establishing their line services. It needs a thorough supervision of the distribution system to work out the details of an electric cooking campaign in a satisfactory manner. This once done it is entirely feasible to acquire a large and profitable load provided the business is handled skillfully from the ordinary sales standpoint. We cannot too earnestly urge the matter upon the attention of electric supply companies as affording a rapid increase of load for the present, and a great opportunity for the future.

Lighting a Movie Studio

THE production of movie films is no slight undertaking from the photographic standpoint. The space within which pictures are to be taken must be, for average work, extremely well lighted whether outdoors or indoors. Outdoors a favoring day and study of the direction of the light makes the task of the photographer easy. Indoors the case is different. In films requiring rapid action, as so many of them do, it is extremely hard to get sufficiently powerful and uniform lighting even with the fast film and large lens apertures employed. Not only must the lighting be brilliant, but it must be capable of very smooth and easy gradation and of quick adaptation to any sort of requirement involved in the change of scene. A very vivid idea of the way in which the problem is practically worked out is given by Mr. Brewster's brief article regarding the lighting of a large movie studio at Ithaca, N. Y.

An interesting feature of the work is that even with high-intensity incandescents these are deliberately burned 10 or 15 volts over voltage still further to enhance their actinic power. The blue bulbs are useful in that they reduce the visible intensity of the light while retaining its photographic power, so that the effect is not so overwhelming as it would be with clear glass bulbs. As a further precaution against the discomfort of the *dramatis personæ* the full power of the lamps is only on for the very brief period required to run off a roll or such part of it as is required for a particular setting.

In doing interior film work outside the regular studio, as is frequently necessary, it is evident that no such lighting equipment as that here described could be plugged on to the local circuits. Consequently a transformer is located on a truck and cut into the high-voltage line circuit at the nearest point, then the secondary heavy cables are carried in through the most convenient window or door, to a portable equipment of receptacles and racks. At times even the available capacity on the primary is insufficient to give the required power at some particular location, in which case another scene has to be hunted up. But generally speaking the portable transformer suffices, and a film play can be successfully staged even in somewhat out-of-the-way places.

The Coming Issues

THE issue now in the hands of the reader is the commercial or fourth number of the ELECTRICAL WORLD for November, and following it next week will appear the public relations number for December. Among the features of that issue will be leading articles on the topics of public-policy developments in the industry, the decision in the rate case of the Edison Electric Illuminating Company of Brooklyn, and the effect of the recent election on tendencies in legislation, besides the regular departments for the engineer, operating man and executive. In the station operating number for the month, dated Dec. 9, an account will be given of the interesting change-over from three-wire single and three-phase to four-wire three-phase recently completed by a central station company operating in a large Western city. A novel scheme for indicating the presence of grounds by both visible and audible signals will also be described in that number. In the engineering issue of the following week a leading article will take up the installation of outdoor high-tension equipment, concluding the discussion on high-tension construction, the first installment of which appeared in the ELECTRICAL WORLD of Nov. 18. The attention of commercial readers is called to the November issue of ELECTRICAL MERCHANDISING, the new monthly magazine of the electrical trade, published as an extension of the editorial service of the ELECTRICAL WORLD. The fifth monthly number of this new paper was issued under date of Nov. 15.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

EMPLOYEES SHARE EARNINGS OF UTILITIES WITH STOCKHOLDERS

New York Edison Company and Affiliated Companies Announce New Profit-Sharing Plan Paying Same Rate on Wages as on Stock

The New York Edison Company and the Consolidated Gas Company and their affiliated gas and electric companies announced on Wednesday that they would hereafter pay to all employees who are earning $3,000 a year or less 7 per cent on their salaries, which is the dividend paid to the stockholders. There are 17,000 employees who will participate in this profit-sharing plan, and the gross amount to be paid to them, it was said, would aggregate $1,000,000 a year.

Among the affiliated companies are the United Electric Light & Power Company and the Westchester Lighting Company. The directors voice their appreciation of their employees as follows:

"It is very gratifying to the directors that they are thus able to show to their employees, upon whom the satisfaction of the public with the service of the company so largely depends, their recognition of the faithful and efficient discharge of their duties, by the adoption of this method of profit-sharing."

OHIO PUBLIC UTILITY MEN DISCUSS LARGER BUSINESS

Merchandizing of Appliances and Isolated Plant Topics Occupy Attention of New-Business Co-operations Committee at Cincinnati Meeting

The new-business co-operations committee of the Ohio Electric Light Association held the first of its winter meetings at Cincinnati on Nov. 21. Two papers were presented and discussed at a morning session, a luncheon was served, and then the delegates spent the afternoon viewing the Cincinnati Electric show which opened on Saturday, Nov. 18, and closed on Nov. 25. The first paper, by C. E. Yacoll of Youngstown, entitled "Promotion of Merchandise Sales During the Holiday Season," outlined in a general way the sales plans which central stations should carry out at this season.

The other paper, by W. H. Whittington of Springfield, entitled "Electric and Steam Service in Hotels, Department Stores and Office Buildings," urged the employment of maximum demand as the governing factor in calculations for electric rates for this class of business. The paper also pointed out that low-pressure steam cooking business is worthy of development by central stations which have exhaust steam to sell. Data from existing installations was presented to substantiate both contentions.

At the luncheon, W. W. Freeman of Cincinnati spoke of the electric show. This year entertainment and amusement features such as ice skating have been combined with the practical exploitation of electrical goods. The crowd at Monday's show was four times as great as the crowd at the show on Monday last year and indications pointed to an attendance of 50,000.

GOVERNMENT ATTITUDE ON WATER POWERS ATTACKED

Southern Central Station Men in Convention Claim South Is Hampered Industrially Owing to Inaction of the Federal Government

The Southeastern Section of the N. E. L. A. through its hydroelectric committee at the convention in Tampa, Fla., Nov. 15 to 17, registered a strenuous protest against the present attitude of Congress toward the development of water powers, claiming that the South is suffering industrially for lack of water power due to government inaction and short-sightedness. Ten papers dealing with general problems confronting the industry were presented and discussed. Among these were "Banking and Its Relations to Public Utilities," "The Conservation and Direction of Human Energy," "Municipal Ownership," "Accounting and Essential Management," "The Maintenance of Central Station Instruments," "Advertising Electricity, Its Service and Application," "Recent Developments in Steam Turbines," "The Future Street Lamp," "General Store and Window Lighting," "The Heating Device Load," and "Grounding of Secondaries." These were all well received and elicited free and frank discussion.

The following officers were elected to serve during the coming year: President, W. E. Mitchell, operating manager of the Alabama Power Company, Birmingham, Ala.; first vice-president, H. A. Orr, manager of the Southern Public Utilities Company, Anderson, S. C.; second vice-president, C. I. Day, manager of the Southern Utilities Company, Jacksonville, Fla. Executive committee: C. D. Flanigen, Athens, Ga.; F. W. Frueauff, Montgomery, Ala.; H. H. Carr, Raleigh, N. C.; F. H. Knox, Spartansburg, S. C., and George Wygant, Tampa, Fla.

CHICAGO ELECTRICAL CREDIT ASSOCIATION MEETING

Improvement Reported in Credits and Collections—Papers on Timely Subjects Were Presented —H. O. Clare Elected President

The committee reports, papers and discussions at the twenty-first annual meeting of the Electrical Credit Association of Chicago at Chicago, on Nov. 16, revealed the fact that credits and collections in the industry are in an excellent state. There has been an actual decrease of about 10 per cent in the credit cases handled by the association in the last year. In spite of this condition, however, the association's members are casting about for new methods of handling business which will still further reduce losses resulting from poor credit. Among the topics discussed were "Contractors as Credit Risks," "C. O. D. Business," "Trade Acceptances," "Trade Name Accounts," Respect for Terms," "Analyzing a Statement," and "Getting Ahead." The election resulted as follows: President, H. O. Clare, Chicago; vice-president, A. O. Kuehmsted, Chicago; executive committee, E. R. Gilmore, H. E. Wilkins and A. O. Kuehmsted; and national representative of the association, B. P. George.

AMERICA'S ELECTRICAL WEEK CELEBRATION DRAWS NEAR

Plans Carefully Laid for This Year's Event, Which Begins Next Saturday with the Flood Lighting of Statue of Liberty

One week from to-day is the official beginning of America's Electrical Week, for the celebration of which plans have been carefully laid in practically every community of any size in the United States. Last year the exposition at San Francisco, with its electrical displays, served to signalize Electrical Prosperity Week.

This year America's Electrical Week will be inaugurated by the first permanent flood-lighting of the Statue of Liberty on the evening of Dec. 2. President Wilson and a distinguished gathering of diplomats and industrial leaders will officiate at a program of ceremonies starting in lower New York harbor and concluding at a magnificent banquet to the nation's executive in the Waldorf-Astoria Hotel.

Mayor Mitchel of New York City will name a committee of some 200 representative men in the electrical industry and in business and civic life, who will escort President Wilson and his party during the inaugural. A committee on arrangement will have charge of an electric vehicle parade starting from the Battery and passing up Broadway to Lafayette Street, over Fifth Avenue to the Waldorf-Astoria Hotel.

The official ceremony of rededicating the statue will take place at the Waldorf-Astoria Hotel. Ambassador Jusserand, who will present a special message from the President of France, and ex-Senator Chauncey M. Depew, who delivered the main oration of the statue thirty years ago Oct. 28, will deliver orations, to which it is expected that the President will reply briefly.

ELECTRICAL JOBBER MUST HELP CREATE DEMAND

Merchandising Methods with This in View Discussed by Westinghouse Agent Jobbers in Annual Meeting

A well-planned program for an interchange of ideas on merchandising methods was carried out at the annual meeting of the Westinghouse Agent Jobbers' Association at the Homestead Hotel, Hot Springs, Va., from Nov. 20 to 23. Business sessions were held morning and evening, with recreation programs for the afternoons.

It was brought out in the meetings that the jobber must help create demand for the manufacturer's product, that he must pass along to the dealer and contractor ideas and suggestions that mean more business for both. It was evident from the papers read before the meeting that there is a new merchandising spirit at work in the industry, and that the enterprising jobbers have already worked out methods of increasing the demand for electrical goods.

The day of the jobber, it developed in the meetings, who sits back and expects a profit merely for handling goods is passing. The jobber of to-day and to-morrow is helping to create a demand for electrical goods by looking for new avenues of sale, better means of handling his salesmen, more knowledge of what it costs him to do business in different lines, and more knowledge of merchandising ideas which he can pass along to his customers, the dealer and contractor.

About seventy-five men were in attendance, representing all sections of the country. On Wednesday evening an informal smoker was given, at which the speakers were Lucien J. Eastin, president of the Columbian Electrical Company, St. Joseph, Mo.; F. M. Feiker, editor of ELECTRICAL WORLD and ELECTRICAL MERCHANDISING, New York City; John J. Jackson, general attorney, and S. L. Nicholson, sales manager, respectively, of the Westinghouse company.

DR. ELIHU THOMSON TO RECEIVE JOHN FRITZ MEDAL

Appropriate Exercises Will Mark the Presentation of the Medal to the Swampscott Scientist in Boston Next Month

The John Fritz medal was awarded in January, 1916, to Dr. Elihu Thomson, "For Achievements in Electrical Inventions, in Electrical Engineering, in Industrial Development, and in Scientific Research."

The medal will be presented to Dr. Thomson at a meeting to be held in Boston on Friday evening, Dec.

PROF. ELIHU THOMPSON
Winner of John Fritz Medal

8, 1916. The presentation will take place in the Central Lecture Hall of the new buildings of the Massachusetts Institute of Technology.

The program of the evening will include addresses by John J. Carty, chairman of the presentation committee of the board of award; E. W. Rice, Jr., president of the General Electric Company, and Dr. Richard C. Maclaurin, president of the Massachusetts Institute of Technology. The presentation will be made by Dr. Charles Warren Hunt, and the ceremonies will conclude with the response of Dr. Thomson.

The John Fritz medal is awarded from time to time for notable scientific or industrial achievement, and was provided for in a fund subscribed in memory of the great engineering pioneer, John Fritz. The award of the medal is made by a permanent board composed of four members from each of four American national engineering societies, namely, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. The members of the 1916 board are: Representing the civil engineers—Charles Warren Hunt, John A. Ockerson, George F. Swain, Charles D. Marx; representing the mechanical engineers—John R. Freeman, Ambrose Swasey, John A. Brashear, Frederick R. Hutton; representing the mining engineers—Albert Sauveur, E. Gybbon Spilsbury, Charles F. Rand, Christopher R. Corning; representing the electrical engineers—Ralph D. Mershon, C. O. Mailloux, Paul M. Lincoln, John J. Carty.

NIAGARA POWER SITUATION BECOMING MORE ACUTE

War Department Permits Further Diversion of Water to Meet Emergency at Buffalo, and Energy from Canada Is Being Denied to American Industries

Recognizing the urgent necessity for additional electrical power in Buffalo, N. Y., Secretary Baker of the War Department has authorized the Niagara Falls (N. Y.) Power Company to divert an additional 1400 cu. ft. of water per second from the river during the peak-load hours in the morning and afternoon. The Canadian government has stopped the exportation of large blocks of Canadian-Niagara power to American consumers and never before has there been such a shortage of power in western New York as during the last thirty days.

Under the provisions of the special agreement with the War Department all additional power generated by the Niagara Falls Power Company must be sent to Buffalo in an effort to relieve the power situation until the first unit of the new steam plant of the Buffalo General Electric Company is placed in operation. This special permission expires on Jan. 1, 1917.

After a hearing in Buffalo at which practically all the large industries of the city were represented, Devoe P. Hodson, public service commissioner for the second district of New York, was so impressed with the seriousness of the situation that he immediately sent a telegram to the federal authorities urging temporary relief by an additional diversion of water from the Niagara river at the Falls. Charles R. Huntley, president of the Buffalo General Electric Company, and other representatives of large industries in western New York went to Washington and made a personal appeal to have the situation relieved.

Many large Buffalo industries have been forced to suspend operations early in the afternoon because of their inability to get sufficient light and power. Thousands of homes in Buffalo have been unable to get electricity for light during the peak-load hours of the late afternoon. City streets have not been lighted until hours after dark because of the situation, and the losses to Buffalo industries within the last thirty days will reach more than $1,000,000. Not only has Buffalo felt the effects of the Canadian embargo but large electrochemical industries in Niagara Falls have been forced to make personal appeals to the dominion authorities for energy to keep their plants in operation.

The Acheson Graphite Company of Niagara Falls, N. Y., which has large war orders to furnish electrodes to the British government, entered a formal protest to the Ontario Hydro-Electric Commission against the embargo on power exportation. W. Acheson Smith, vice-president of the company, received a reply from the Canadian authorities in which the Ontario commission said it could do nothing to protect American industries so long as there is increased demand for electric power throughout the province of Ontario.

About three months ago the Ontario government was asked for additional power by Canadian munitions factories and a demand was made upon the Canadian Niagara Power Company for a larger supply. The company agreed to furnish 50,000 hp. after a threat had been made to stop all exportation. The Canadian Niagara company is only supplying 35,000 hp. and the commission has demanded the additional 15,000 hp. at once. Already an embargo has been placed on more than 18,000 hp. formerly sent to Buffalo and other western New York cities, with the result that American generating companies have been unable to fill the increased demands made upon them.

There is a demand for 84,000 hp. in Buffalo. What is being supplied is 37,500 hp. from the Niagara Falls Power Company; 13,000 from the Toronto Power Company and 13,000 additional from the same company when there is no other demand for it and 1000 hp. from the Niagara Falls Power Company, generated under a temporary permit which expires when the first unit of the new Buffalo General Electric Company steam plant is in operation. The maximum supply received is 78,500 hp. but this amount is not available where there is the greatest demand. In December, the commission's expert said, there will be a demand for 90,000 hp. It is expected the first unit of the Buffalo General Electric Company's steam plant generating approximately 25,000 hp. will be in operation in December.

INSULL DISCUSSES EARNINGS OF CHICAGO UTILITIES

Capital of City's Public Utilities Is About $575,000,000 —It Earns an Average of 6 Per Cent—Expenses of Companies Are $70,000,000 Annually

Speaking before the Chicago Real Estate Board on Nov. 17, Samuel Insull, president of the Commonwealth Edison Company of Chicago, made a plea for greater co-operation between the public utility consumer and legislative organizations and public utility corporations. He said there is an erroneous impression in the minds of most people that public utility companies earn a much greater percentage on their capital stock than they are entitled to.

It is the popular idea, said Mr. Insull, that the stock of the public utility companies is made up of a considerable part of "water." This is a mistaken impression. Between $550,000,000 and $575,000,000 is invested in the public utilities of Chicago. The gross annual income of these properties is approximately $100,000,000. Instead of Chicago utilities being over-capitalized, as is the general idea, they are under-capitalized as to income and only fairly capitalized as to their bonded securities.

It requires a considerable amount of money, continued Mr. Insull, to maintain the public utilities of the city. An estimate places the amount necessary for this work at $20,000,000 annually. It is not an unusual thing for the Commonwealth Edison Company to spend $6,000,000 a year, while the Chicago Telephone Company spends from $5,000,000 to $5,500,000 yearly, and additional large amounts are used by the elevated and surface lines for new equipment and other improvements. The expenses of the companies total about $70,000,000 a year, while the net income is about $30,000,000, or about 6 per cent on the issued securities.

While there is considerable talk as to the large amount of money made by the gas and electric companies, they as a matter of fact get a lower return on the capital invested than any individual would be satisfied to receive from his personal investment. Moreover, there is no body of investors who have the general interests of the community more at heart than the stockholders of public utilities. Their taxes and compensation to the city authorities total about $8,000,000, or an amount equal to 11 or 12 per cent of the total operating expenses of the municipality.

In closing Mr. Insull said further that if the public utilities are not treated fairly the citizens using the facilities of these utilities must suffer. The operation of a public utility is a performance of a semi-municipal function. If they are not treated fairly there is a lack of credit and confidence and the corporations find it difficult to raise the funds necessary for the extension

of activities. The present car shortage is an instance of the operation of this principle, for it is due not so much to increasing business as it is to the lack of support given the railroads in their efforts to please the shippers.

MEMPHIS NEGOTIATIONS END WITHOUT AGREEMENT

Mayor Ashcroft Announces that City Administration Proposes to Go Ahead with the Construction of a Municipal Power Plant

Negotiations between the city of Memphis, Tenn., and the Merchants Power Company and the Consolidated Gas & Electric Company, the utilities now operating, apparently have been concluded without agreement. The city has sold its $1,500,000 of bonds for construction of a municipal plant, and proposes later to issue another bond issue of the same size. Mayor T. C. Ashcroft has announced that the city administration proposes to go forward with construction of the city plant according to its promises to the people.

The city has held out for a 5-cent rate or its equivalent, while the utility companies have insisted that they could not operate at that price.

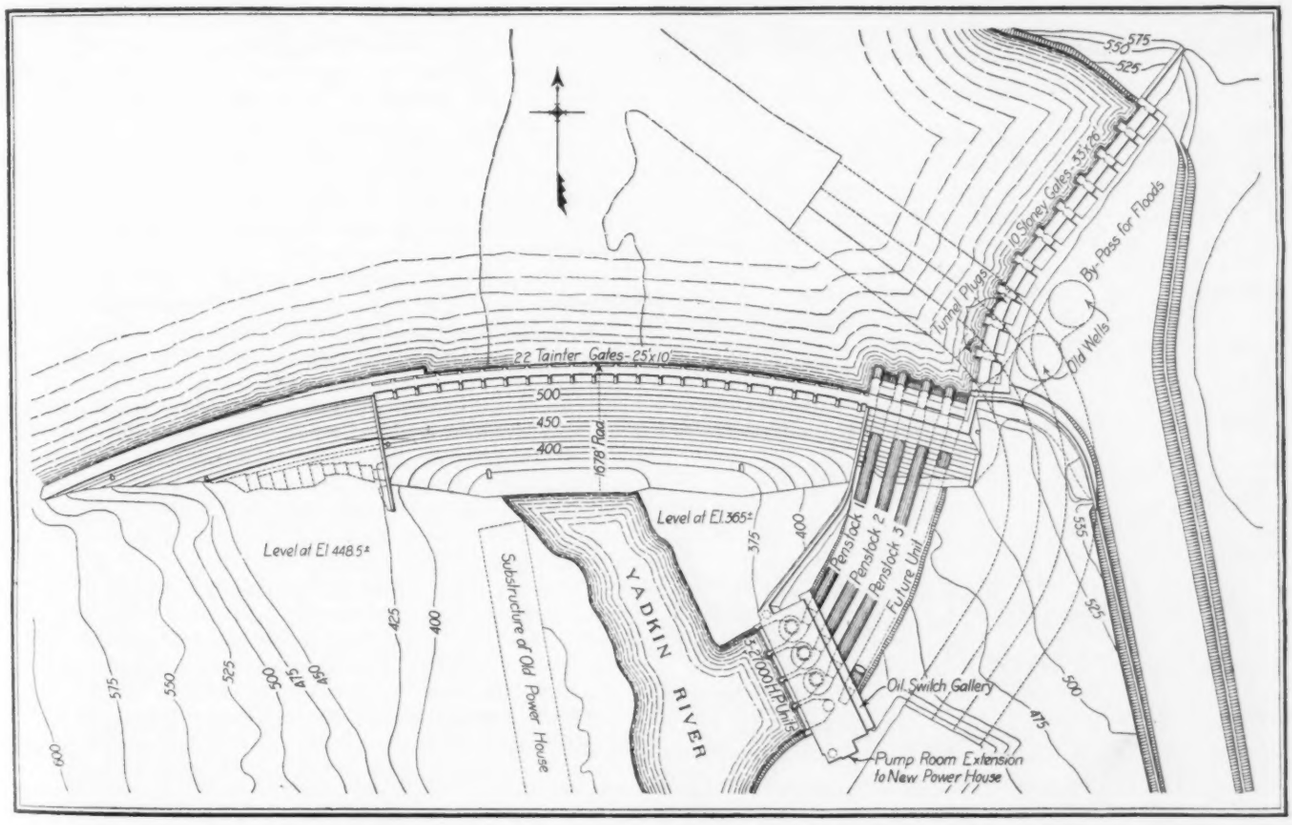
A committee of twenty citizens, representing a number of the civic organizations and including a number of engineers, has recommended that the city's project await a better market on equipment and materials and has questioned the estimates of cost and earnings of the municipal plant as given out by F. W. Ballard, of Cleveland, consulting engineer for the city. A clause in the contract for the sale of the bonds provided that if the city desires so to do, it may cancel the sale within thirty days, or before the middle of December, by payment of $15,000.

MAMMOTH WATER TURBINES IN YADKIN RIVER STATION

Badin (N. C.) Hydroelectric Plant of Tallassee Power Company, Subsidiary of Aluminum Company of America, Ready for Operation Early in 1917

The three single runner Francis turbines installed in the plant of the Tallassee Power Company on the Yadkin River in North Carolina, with a guaranteed rating of 31,000 hp. under an effective head of 180 ft. and 27,000 hp. under 165 ft. at 154 r.p.m. are the largest units yet built. This station was begun in 1912 for the Southern Aluminum Company and the work carried on under the direction of French engineers. The Tallassee Power Company, which is a subsidiary of the Aluminum Company of America, bought out the French company after the latter ceased construction due to the war conditions in 1914 and work is now being pushed to completion so as to begin operation by the first of the year. The work on the site was begun by the Tallassee Power Company in January, 1916.

The power station is on the east side of the Yadkin River near Badin, N. C. The initial installation will consist of three vertical shaft single runner turbines of the rating named direct-connected to alternating-current



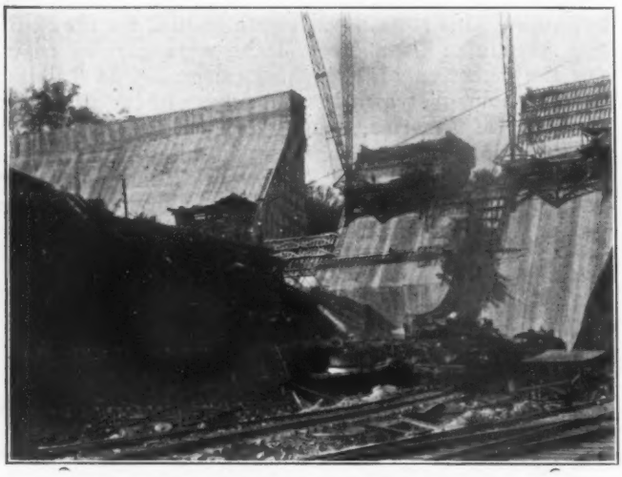
LOCATIONS OF OLD AND NEW STATIONS, TUNNELS AND WELLS OF YADIN RIVER DEVELOPMENT AT BADIN, N. C.

13,200-volt, 36-cycle generators rated at 18,000 kva. The generators are 28-pole units and have an overload guarantee of 22,500 kw. at unity power factor with an efficiency at 18,000 kva. and unity power factor of 96.9 per cent.

The turbine runner which weighs 20,000 lb. is a single piece of solid bronze and probably the largest casting of its kind ever made. A governor of essentially standard design of the wheel manufacturers is used in which flyball actuated valves control the admission and discharge of oil to two operating cylinders that have piston rods

running to the shifting rings. The total weight of the revolving parts and the reaction thrust of the loaded runner are carried on a Kingsbury thrust bearing.

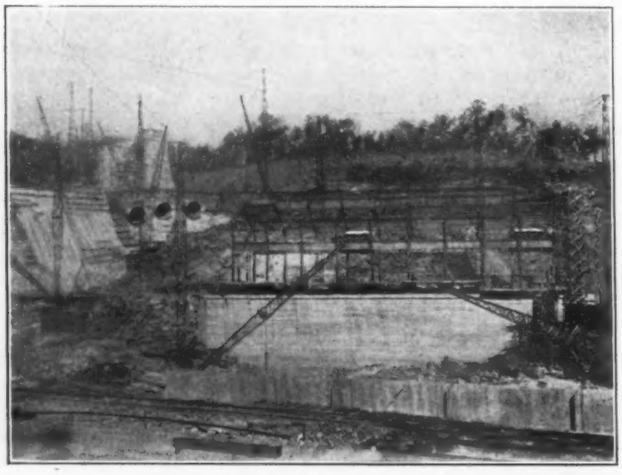
The Hardaway Contracting Company of Columbus, Ga., is contractor for the work which is being carried on under the direction of Edwin S. Fickes, chief engineer of the Tallassee Power Company, a subsidiary of the Aluminum Company of America, with G. F. Murphy as principal assistant. The turbines were designed and have been installed by the Allis-Chalmers Manufacturing Company of Milwaukee, Wis., under the direction of



DAM BEING CONSTRUCTED ACROSS YADKIN RIVER

W. M. White, chief engineer of the hydraulic department. The generators and exciters were furnished by the General Electric Company of Schenectady, N. Y.

The Badin, N. C., plant is of especial interest on account of the fact that work on the plans was started in 1901 and has been in the public eye as a proposition of wonderment on account of the capital invested and never used. With an idea of securing abundant hydroelectric power one elaborately constructed dam of cut stone was built and abandoned at the cost of around $3,000,000 and a new structure started which would cost around $2,000,000. French capital was largely involved until



POWER HOUSE IN PROCESS OF ERECTION

the site and property was purchased by the Aluminum Company of America in 1914. The initial installation worked up by the French company known as the Southern Aluminum Company is of special interest since it called for five double waterwheels direct-connected, direct-current, 520-volt generators of 5200-kw. each, with arrangements for eighteen of these units and two alternating-current units of 1200-kw. each. These units were purchased and ready for installation when the property was taken over by the Aluminum Company of America. The 5200-kw. generators have been remodeled as rotary converters to operate on the frequency of the generating system of 36 cycles.

GENERAL ELECTRIC HEAD PLEADS FOR CO-OPERATION

E. W. Rice, Jr., Points Out at Annual Founders' Conference the Necessity of Preparation for Future Industrial Competition

With peace the troubles of the American manufacturer will just begin, it was declared by E. W. Rice, Jr., president of the General Electric Company, in a paper read before the twentieth annual conference of the National Founders' Association, held on Nov. 15.

The subject of Mr. Rice's paper was "How Shall Manufacturers Contribute to American Industrial Progress?" At the same gathering it was announced that the National Industrial Conference Board had been formed to prepare the industries of the United States for the economic changes that are to follow peace in Europe.

In his paper, Mr. Rice continued as follows:

"We have received ample notice that the principal actors in the present struggle will then begin what has been termed an industrial war. This industrial war will not permit us to remain neutral because it will be aimed to a large extent at us and we will become involved whether you like it or not. It is evident, therefore, that we as a people, and especially those directly interested in our manufacturing industries, will be faced with new, complex and even menacing conditions.

"We read in a recent number of *Nature*, an English periodical, of the organization of a federation of British industries which includes the leading manufacturing and producing industries of Great Britain. The objects of the federation are: 'The organization and development of the industry now and after the war in co-operation with labor and in conjunction with the government and government departments. These and other signs show that our leading business men are prepared to do their part toward strengthening British industry and commerce for the competitive struggles of the future.'

"German industries also are unimpaired and are even improved and increased, and after the war, under the well-known system of governmental protection and assistance, will be in a position to compete more efficiently than ever before for the world's markets.

"Simple prudence, to say nothing of foresight, should impel us to take advantage of our present condition of extraordinary prosperity to prepare ourselves for the future.

"It will not require a very exhaustive process of self-analysis to disclose that we are all relatively deficient in discipline and co-operation compared with the conditions which will exist in industrial Europe after the war.

"But this is not all. Our governmental agencies, federal, state and municipal, must be won over to support proper industrial effort by sympathetic assistance. The manufacturers of other countries will have the great advantage of the intelligent and sympathetic help of their governments and of their people, and patriotism will be lifted to the highest plane.

"It is obvious that there must be unity of purpose and unity of action, not only among manufacturers, but

among all of our people, if we are to succeed in maintaining our position in the industrial world.

"The National Conference Board, recently brought into action as a co-operative force among manufacturers throughout the country, is the type of agency which under wise and efficient leadership will be a potent factor in the solution of the many vexing problems herein briefly outlined and of many more that are constantly arising with changing social, industrial and political conditions."

WIRELESS FOR WESTERN TRANSMISSION SYSTEM

Southern Sierras Power Company Arranges for Radio Service Between Its Generating and Substations in California

The Southern Sierras Power Company, a subsidiary of the Nevada-California Power Company, operating in the Owens River Valley and Imperial Valley sections of southern California, has adopted interesting and effective plans for wireless service between its different generating plants and substations, to afford utmost reliability of station communication under all conditions of operation. The company's system extends from Bishop to Calexico, a total distance approximating 400 miles, with distributing lines covering the San Bernardino, Riverside and Perris Valley districts, embracing a total population of 100,000. Five hydroelectric power plants are located in the vicinity of Bishop, with addition of a steam turbo generating station of 11,000 hp. capacity at San Bernardino. A double three-phase high-tension steel tower transmission line extends north from the San Bernardino plant, passing through Victorville, Keeler, Independence and Big Pine to Bishop. The northern plants at this latter place are located in a particularly rugged country, subjected to severe storms, floods and other unusual weather conditions, and causing considerable difficulty from time to time in maintaining communication over metallic circuits.

Recognizing the advantage of radio service under such conditions of operation, extensive investigations of the possibilities for station communication have been recently under way, leading to a definite plan for the adoption and installation of wireless service for regular and emergency work over the entire system. Of decided benefit in connection with these plans is the training and experience that the station operators have received in the use of the key, due to the active employment for some years past of a telegraph system, superimposed upon the private telephone lines covering the transmission territory of the company.

Two sets of radio equipment have been installed in important stations on the main transmission system leading into San Bernardino with highly satisfactory results, and other installations are now being made along the northern section of the route. It is planned to provide all of the other stations with similar apparatus in order that radio communication may be effected between every necessary point throughout the system. Some of the plants will be equipped with apparatus capable of a transmitting radius of 500 miles or more, while others will be designed for connection with the next adjoining substation only, according to the character and particular function of the station.

The company has interested the station operators in this work to a gratifying extent, providing them with equipment and instructions so as to become thoroughly adept in wireless operation, and also encouraging an accurate and comprehensive knowledge of the wireless code. In a very short time the operators have become well versed in the use of radio apparatus. The installation of the new system will be carried out under the supervision of the engineering department of the company.

NEW STEAM TURBINE STATION TO BE BUILT IN TOLEDO

Doherty Organization Announces Plans for a Second Station in the Ohio City with a Probable Rating of 120,000 Kw.

Henry L. Doherty announced at Toledo, Ohio, on Nov. 20 that plans are being completed for a new central station for that city, which may have a capacity of 120,000 kw. and cost about $6,000,000. Such a plant will be capable of taking care of an increase of 100,000 in population, he said, and Toledo will have that many more people within the next five years. It is possible that it will be located on the old rolling mill property on the East Side, which is owned by Mr. Doherty, but if it proves that this property is too high for the purpose, it may be placed outside the city limits.

It is not the intention to abandon the Water Street plant, whose capacity has been gradually increased to 80,000 kw. It will be used to supplement the new plant. In all probability the city railway lines will depend upon this company for power, however they may be owned; the interurban roads will need additional power, and both the power and light business in the city is growing rapidly.

Mr. Doherty said he had asked M. R. Bump, chief engineer of the Doherty properties, to come to Toledo with all his plans and thereafter the two will hold daily sessions until they are fully completed. A new station is necessary to meet increasing demands.

POWER COMPANIES CUT RATES TO MEET COMPETITION

California Commission Grants Permission to Pacific Power & Light to Meet Rates of Los Angeles in Part of City

A new element was injected into the power controversy in Los Angeles when the California Railroad Commission granted the Pacific Light & Power Corporation a special permit to invade competitive territory and meet the city's proposed reduced rates for electrical energy in the Highland Park, Garvanza and East Los Angeles districts.

First knowledge of the Railroad Commission's action on the power company's application was received by President Lane of the Los Angeles Utilities Board when the order of the state commission was laid before him by representatives of the power corporation.

President Lane said:

"The Railroad Commission has granted the Pacific Light & Power Company a special permit to charge the city's proposed rates in the territory where the city is supplying power. In this way the private company is allowed to reduce its rates and meet the city's prices.

"Immediately the question of discrimination arises. This matter will be carefully investigated by the utilities department. I have grave doubts whether the power company is permitted under the law to charge one rate in one part of the city and another rate in another section.

"The companies have been charging 5.5 cents. The city's proposed rate for its distributing system is 5

cents. Now the Pacific Light & Power Company has been allowed to cut its rate to meet the city rate."

Representatives of the Pacific Light & Power Corporation said that the question of alleged discrimination was threshed out with the Railroad Commission and that it was made plain that the company is only permitted to reduce rates to meet competition in a certain territory.

FEDERAL VERSUS STATE REGULATION OF UTILITIES

National Association of Railway Commissioners Opposed to Exclusive Federal Control of Interstate Carriers and Other Utilities

Although the committee organization of the National Association of Railway Commissioners was expanded last year to provide for greater attention to problems affecting utilities other than steam railroads, the reports of the four new utility committees on rates, service, safety, and statistics and accounts which were presented at the annual convention in Washington, D. C., last week, occupied a quite subordinate position. Taken as a whole, they covered important points in utility regulation, but in most cases they were simply received and filed with little if any discussion. At practically all of the sessions, from Nov. 14 to Nov. 17 inclusive, the topic of discussion was the inadvisability of exclusive federal control of interstate carriers and other utilities. The association was in general opposed to any abolition of the present dual system of regulation, and it favored legislation by Congress authorizing the courts to determine which is the reasonable rate in the case of conflict between federal and state commission orders.

Public Utility Rates

The first report of the other-than-steam railroad committee group dealt with rates. Although this specifically covered electric, gas and water companies, it aimed to bring together in concise form the more important principles, theories and practices connected with utility rates. Starting with the fundamental statement that rates must be just and reasonable so as to produce a fair return on the fair value of used and useful property, it was claimed that the amount of return should be such as to provide for the cost of economical and efficient operation, taxes, depreciation, a fair net return of the value of the property devoted to public use and a proper margin for the successful conduct of the business. Exceptional efficiency of management should receive consideration and encouragement. It was deemed a sound business principle worthy of general adoption "that decreased costs and increased profits due to skillful and wise management shall be shared in lower prices to the public and higher dividends to the stockholders."

The report was signed by Thomas W. D. Worthen, New Hampshire, chairman; M. H. Aylesworth, Colorado; Robert C. Bacon, Vermont, and John J. Treacy, New Jersey.

The discussion of this report concerned in the main lighting rates. It was suggested by a utility representative that "value of service" as a rate basis might well be considered to a greater extent, but the commissioners did not see how the question of service value entered the case if they knew what the term meant. In regard to the advisability of basing rates for municipal service on the same principles as those for private service, Commissioner Walter A. Shaw, Illinois, thought the plan all right in theory, but mentioned various snags in the form of ordinances, tax limits, etc., that would make it difficult in practice. The report was simply received without adoption and ordered to be printed.

Public Utility Service

In the opinion of the committee on public utility service, patrons of a public utility are more dependent upon the public service commission in the matter of correcting unsatisfactory service than they are in the matter of securing reasonable rates. The report described the general features of commission work in checking and regulating service, and then took up in detail questions arising in connection with different classes of utility service.

The committee made the following general recommendations, which were adopted by the association:

1. That the matter of regulating the service of public utilities, other than steam railroads, be vested (as is now done by many of the states) in the public service commissions of the various states.

2. That each state commission establish standards of service for each class of public utilities within its jurisdiction.

3. That inasmuch as some kinds of public utilities are not confined to state boundaries, some uniformity of standards is desirable, to the end that a single enterprise, doing business in several contiguous states may not be required to observe a different standard in each state.

4. That each state commission prescribe forms, upon which the various classes of public utilities shall be required to keep a record of the important factors that indicate the character of the service of such utility.

5. That each committee establish and maintain a service division to inspect and from time to time determine the quality and character of the service furnished by the various public utilities.

6. That each commission recognize at all times the importance of adequate service to the public, and that it take such steps as may from time to time be necessary to insure the furnishing of adequate and efficient service by public utilities.

The report was signed by Richard Yates, Illinois, chairman; John M. Kinkel, Kansas; H. B. Shaw, Missouri, and Travis H. Whitney, New York, First District.

Safety of Operation of Public Utilities

The committee on safety of operation of public utilities reported that the subject covered such an extensive field that it probably could not be dealt with satisfactorily from the standpoint of discussion or recommendation. In its opinion, probably the corporations which have made the greatest advances in improving the safety of operation are the electric railway and the electric light and power corporations. It was one view of the committee that commissions should have full power and authority to make orders covering operating matters affecting safety whenever they seemed to be required. There are so many opportunities for corporations, however, to benefit financially and otherwise by making their operating conditions as safe as possible that the committee felt that the matter might be safely left with the utilities primarily, and that the work of the commissions should be principally devoted to investigating operating conditions, from time to time giving advice to the corporations with reference to such operations and making recommendations concerning them whenever it seemed proper to do so. If the corporations understood this to be the attitude of the commissions, there was no reason why there should be any friction between the interested parties. The report

was signed by James I. Carr, New York, Second District, chairman; C. F. Foley, Kansas; R. W. E. Dunges, New Jersey, and S. S. Kendall, Colorado.

STATISTICS AND ACCOUNTS

The action of the association on this report was confined to referring to the executive committee the section dealing with the organization of a separate association of commission statisticians and accountants, and that dealing with the question of federal commission jurisdiction over local utilities incidentally engaged in interstate commerce, and also to merely receiving the remainder of the report without adoption. Thus the proposal for uniform depreciation rates for gas and electric utilities was dismissed with only a short discussion.

FEDERAL VS. STATE REGULATION

The first indication of the attitude likely to be taken by the association in the matter of federal versus state regulation came at the very beginning of the convention, when R. C. Prentis, Virginia, president of the association, in his opening address opposed exclusive federal control of interstate carriers. President Prentis said that there is an organized movement having for its ultimate object nothing less than the absolute elimination of the state commissions from all jurisdiction over interstate rates, and that the movement was inspired and fostered by the railroads. If the movement should succeed the work of the last thirty years in building up state regulation would be lost. The most serious complaint now made against the present dual system of regulation was the lack of uniformity, but it would not be wise to destroy the very agencies through which such uniformity as did exist had, in great measure, been secured. The association adopted a resolution to the effect that for the settlement of disagreements between federal and state commissions, Congress should restore to the courts the power of saying what is a reasonable rate.

CAPITALIZATION AND INTERCORPORATE RELATIONS

The elaborate report of the committee on capitalization and intercorporate relations, the second general report, which was somewhat in contradiction to the report of the committee on federal and state legislation, was read and simply received with little discussion. Among the recommendations were the following:

That the Interstate Commerce Commission or some other federal agency be empowered to regulate the rates, practices, stocks and bonds of the interstate public utilities.

That Congress enact the necessary legislation to provide for a national incorporation act for interstate railroads and interstate public utilities.

That federal and state statutes be amended, where necessary, to permit of the issues by railroads and public utilities of a common stock without par value.

That the Interstate Commerce Commission and the state public utility commissions be permitted to invoke the aid of the Federal Trade Commission to determine the reasonableness of the cost of essential materials of railroad and public utility construction.

That adequate legislation be enacted, both national and state, to provide for voluntary wage agreements; methods of arbitration, and for federal and state intervention in emergencies, to adjust wage conditions in the railroad and public utility service; nothing contained in such legislation to require men to work against their will.

New officers were elected as follows: President, Max Thelan, California commission; first vice-president, E. C. Niles, New Hampshire commission; second vice-president, C. E. Elmquist, Minnesota commission; secretary, W. H. Connolly, Interstate Commerce Commission, and assistant secretary, James B. Walker, New York commission, First District.

TAKING POSTCARD VOTE ON DALLAS FRANCHISES

Rates Based on Sliding Scale—Reserves to Automatically Govern Rates and Return on Valuation

Printed forms of the proposed railway and lighting franchises were mailed on Monday to the Dallas, Tex., voters which they may either approve or disapprove in the postcard vote now being taken. It is expected that the vote will be in process about two weeks. The postcards are to be mailed back to a canvassing committee appointed by the local government. Should the voters approve of the proposed franchises the city government will pass them in precisely the form as submitted.

A total valuation of $8,500,000 is called for in the two franchises, $4,100,000 for the railways and $4,400,000 for lighting.

The lighting franchise is based on a sliding scale. With an 8-cent rate the return will be 7 per cent; with a 7-cent rate an 8 per cent return; with a 6-cent rate a 9 per cent return. For every further 0.5-cent reduction in rates the return on the valuation will go up one-quarter of 1 per cent.

After ten years the city has the right to purchase the property at its value plus a premium of 5 per cent plus an additional premium of 5 per cent on so much of the investment as shall have been made in the ten years prior to the city's purchase.

The city is to appoint a supervisor of public utilities, and as money is spent from day to day on capital account it is added to property value so that the property value will always be definitely known.

After all charges and return are deducted from gross earnings a reserve is left which is to be built up. As soon as these reserves go above the normal point agreed upon the rates automatically drop, and if the reserve falls below this normal the rates automatically go up in certain predetermined steps. This precludes rate hearings, since the reserves act as a governor of rates.

The franchise is indeterminate, continuing until the city buys the plant. All disputes are to be submitted to arbitration. It is thus hoped to take the public utilities out of controversy of every kind with the municipality, making their operation purely a definite business question.

As proposed the plan means an incentive to increased efficiency and economy, which is not the case when rates are based on fixed returns with a strict percentage basis for two reasons: First, by offering a higher rate of return as an inducement for maximum economy and efficiency in operation, and second, by distributing the benefits of advances in the art between the public on the one hand and capital on the other.

The regulation of the rates and the return will take place every six months. The reserves, which will act as an insurance of the return, will equal one year's return.

Capital investment is therefore insured (1) by the indeterminate feature of the franchise; (2) by the fixed price at which the city may take over the property; (3) by the continuity of return insured by the reserves.

It is expected, therefore, that the plan will make a direct appeal to strictly investment money, which with principal safeguarded and continuity of return guaranteed is thought will be the cheapest money.

Winning the Electric-Cooking Load

What the Electric Range Offers to Both Central Station and Customer—The Value of the Cooking Load, and the Development Work Which Must Be Undertaken to Secure It

By S. M. Kennedy
General Agent Southern California Edison Company

As civilization has advanced, increasing care has been given to the preparation of food until cooking has become an art. The introduction of electricity for heating and the perfection of the apparatus and appliances used has, moveover, raised cooking to an exact science. With electric cooking "hit-or-miss" methods and the vague instructions of the old cook books are fast becoming obsolete. The reason is that with electricity there is perfect heat control. The electric cooking apparatus has a predetermined rating, and when switched on for a given time must generate a certain amount of heat. The heat is delivered when and where it is required, and is not subject to any variation from extraneous causes. The result is that when any cooking operation has been successfully performed, it can be repeated at any time with perfect certainty.

It may be of advantage to consider here what the purpose of cooking is—that is, why is food cooked at all. The attractions of the table are substantial to a normal man. He knows that properly cooked food is more appetizing, because it not only has an improved appearance, but has developed new flavors. The cooking of certain foods renders them more digestible, and their nutrient parts can be more readily absorbed by the digestive organs. Further, food is cooked to sterilize it, to delay decay, and to preserve for future use. We eat to live, and it follows that properly cooked food is more appetizing, and being more appetizing it becomes more digestible, and being more digestible the body is more readily nourished, and being properly nourished we are healthy and equipped to cope with the affairs of life whatever they may be. Consequently, the purpose of cooking is evident and its importance apparent. The paramount question at this time is, can electricity meet all the requirements for cooking under modern conditions and, if so, what are the advantages to be gained by stimulating its use (*a*) to the manufacturer, (*b*) to the central station, and (*c*) to the consumer? The interested parties are mentioned in this order because there must first be the proper apparatus, then the proper service and rate, and finally, with the first two factors satisfactory, the man who eats must be educated to buy the appliances which are efficient, and must be fully instructed in their use.

The electrical engineer must of necessity be deeply concerned in all three classes mentioned. It is up to the engineer to design and construct the proper apparatus for using electric energy for cooking; none but the engineer can solve the problems of distribution which are developing as the cooking load increases, and the commercial engineer will be the man who must educate the public and nurse the business after it has been obtained.

Electric Range Commercially Successful

Electric cooking may be divided into two classes—minor and major. During the past ten years many electrical appliances have been invented and produced for doing certain lesser kinds of cooking work, and doing it well, such as coffee percolators, hot-water heaters, toasters, chafing dishes, grills and other devices adapted for use in the household. These have been termed lamp-socket appliances, and throughout the United States there are many hundreds of thousands of such appliances in daily use. These devices have been efficient and satisfactory as far as they have gone, but they have been generally used as convenient auxiliaries to some other method of cooking which has taken care of the main requirements of the family. Such appliances are doing minor cooking. On the surface it would appear as if up to a comparatively recent date the use of electricity for major cooking had been more or less neglected. This neglect has not been because the field has been overlooked, but rather that heretofore conditions have not been propitious. There has been much to learn regarding the construction of the apparatus, the character of the load, and the methods of handling the troubles which always go with the development of an entirely new class of service. The difficulties which were at first confronted have been gradually reduced,

FIG. 1—ELECTRIC RANGE WITH THREE BURNERS ON TOP AND LOWER OVEN, OPERATED BY CHINESE COOK

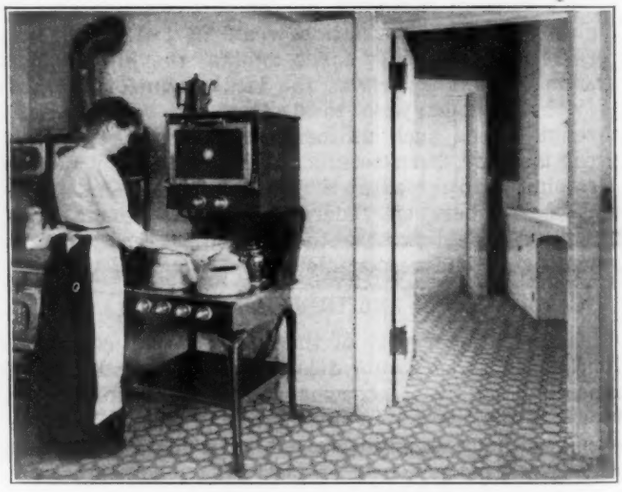


FIG. 2—THREE-BURNER RANGE WITH ELEVATED OVEN. THIS RANGE IS BEING OPERATED BY A MEXICAN SERVANT

and in many respects entirely eliminated. The electric ranges now produced by manufacturers who have given electric appliances close attention may still be open to improvement, but they are commercially successful. That such is the case is best illustrated by an extract from a circular letter sent out this year by a gas-range manufacturer to a gas company in California. The object in sending the letter was evidently to awaken the gas industry so that they might meet the new competition:

"You doubtless are well acquainted with the following facts:

"1. That the electric range has arrived, and come to stay. It will do what the ordinary gas range will not do. It is more sanitary; it saves work in the kitchen; it does better cooking.

"2. That the gas stove is doomed for cooking purposes and will go just as the gas light went, unless a gas stove can be made to duplicate the results of the electric range.

"3. That gas maintains its superiority in the cooking field to-day solely because it is cheaper than electricity.

"4. That electricity is constantly becoming cheaper, and is now so cheap in many parts of the country that the electric-stove companies are prospering."

The progress of cooking from the open hearth to the wood or coal range, then to the gas stove, and to the present electric range has been marked at each stage by the use of a more costly fuel. This, however, has been offset by obtaining a greater efficiency and better control of the heat. The problem for the manufacturer has been to construct electric cooking apparatus at a reasonably low cost which, at the same time, will be efficient in operation. The majority of the manufacturers who are producing electric ranges have followed the lines of the modern gas range, which is no doubt a good lead for the present. There are three principal designs for gas ranges which have been successful sellers, and these have been electrically duplicated. Fig. 1 shows a range with three burners on top and a lower oven. Fig. 2 shows a three-burner top with an upper oven. Fig. 3 shows a six-burner top with shelf and two side ovens. Fig. 4 shows a similar type with three burners and automatic equipment. The illustrations represent stoves installed in kitchens where they are in daily use. The flexibility of the electric range is demonstrated by the fact that the four cooks shown in the illustrations are of four different nationalities—Chinese, Mexican, Swedish and American.

FIG. 3—SIX-BURNER RANGE WITH TOP SHELF AND TWO SIDE OVENS

FIG. 4—THREE-BURNER RANGE WITH DOUBLE OVEN AND AUTOMATIC CONTROL

While recognizing its general utility, it is admitted by its best friends that the modern gas range is one of the most inefficient types of cooking apparatus—that is, of the heat units which go into it, a large percentage is absolutely wasted. The future development of the electric range may be along more advanced lines, rather than a continual imitation of the gas range. When the first automobiles were put upon the market they were constructed so as to resemble the buggies and carriages formerly drawn by horses. However, the automobile manufacturers have gradually developed machines with entirely different lines, better adapted for the work which is put upon them. It is quite probable that the development of the electric range will produce changes in type and design which will be fully as radical.

OPEN-COIL VS. INCLOSED-UNIT BURNERS

It may be conceded that for to-day the general types of the frames of electric ranges, as patterned after the gas stoves, are satisfactory, and we therefore pass on to the burners. In this connection there is some decided difference in opinion—principally between the advocates of what is called the open-coil type and the disk or inclosed-unit type. The open-coil burner operates largely on the principle of radiation—that is, the movement of radiant heat rays from the exposed coil to the bottom of the utensil. The disk burner operates primarily on the principle of conduction—that is, by actual contact between the bottom of the utensil and surface of the disk. As between these two, and the proper kinds of utensils to use with each, there has been much testing and discussion, and in some respects the discussions and testings have not reached conclusions which are entirely satisfactory.

Of the open coils there are two kinds—coils placed in grooves in moulded blocks, and coils supported by steel frames, and insulated by means of mica or porcelain. One or two manufacturers are making burners with removable reflectors which are placed beneath the open coil, and it is claimed with apparent reason that this combination will considerably increase the economy by concentrating the heat rays upon the cooking utensil. As to durability, two of the leading range makers, one using inclosed units and the other open coils, state that their burners will now average 5000 hours of actual service. In other words, the average life of their units in use in the average home will be approximately seven years.

The inclosed cooker pot is being utilized extensively

and satisfactorily in many electric ranges. This feature tends toward economy of operation, and has some distinct advantages. The cooker pot can only be used with the inclosed type of burner.

It cannot be denied that the open-coil burner appeals to the housewife, because she can see the glowing coils. This is more like what she has been using, especially if her cooking has been done with gas. When she snaps the switch there is a quick response, and the heat is immediately apparent to the sight as well as to the feeling. The most important factor in the satisfactory operation of an electric range is the heating element. It is also essential that elements which are likely to burn out may be readily and quickly replaced, so that there may be no unnecessary delays in repairing.

Open-Coil Heater Best Adapted for Dull-Surface Utensils

Regarding the most desirable utensils to use with the different types of burners, one of the advantages of the open-type unit is that the average utensil, in the average used condition, such as is found in the average home, will give the highest economy. In other words, a dish with a dull surface will absorb the radiant heat rays from the open-coil unit to the best possible advantage.

With the disk or inclosed type of burner it is apparent that the utensils should be smooth, flat and have a thoroughly cleaned surface, so as to make a good contact and obtain the best possible efficiency. Apparently it has been definitely decided that the disk or inclosed type of burner will give better results if aluminum utensils are used, and that with the open-coil burner the enamelware utensils seem to give the most satisfaction. The ordinary utensils used on a gas stove may be used on an electric range, whether open-coil or inclosed type. As the open-coil burner more nearly resembles the gas burner, it naturally follows that the ordinary kitchen utensils used on gas stoves are more likely to operate with greater efficiency on the open-coil burners than on the inclosed or disk-type burners.

Range Sizes Best Adapted for Household Use

There are now many sizes and types of good electric ranges on the market, each suitable for certain requirements and conditions. The consensus of opinion is that the ideal range best adapted to meet the cooking necessities of the average family is one which has four burners on top, the capacities of which should be one 1500-watt, one 1200-watt, one 1000-watt and one 800-watt, each burner having three heats. There should be a shelf and two side ovens, one with an upper and lower burner for broiling and baking and the other a warming oven. The oven doors should open down. There should be a receptacle on the side for the additional use of lamp-socket appliances. Such a range can do a large amount of work, or a lesser amount with equal economy. For apartment houses ranges of smaller sizes are more desirable on account of the limited space usually available.

The essential features in a standard range of any size are (*a*) reliable heating elements that may be easily, quickly and cheaply renewed; (*b*) easily cleaned, non-rust oven, with substantial fitting door; (*c*) dependable oven thermometer; (*d*) range frame of substantial construction; (*e*) terminal contacts installed so that troubles from this source may be eliminated as far as possible; (*f*) separate fuse plugs (*g*) at least one plug for attaching coffee percolator, toaster or other small appliances; (*h*) ovens should be well insulated and not less than 12 by 16½ by 18; (*i*) ample capacity in burners, so that delays in cooking may be avoided.

All progressive power companies are looking for greater plant efficiency and better load factors in order to produce greater returns on present investment. The electric-cooking field most certainly points the way to more intense development at a relatively small additional outlay. The electric range load has not and probably will not for several years reach such a volume for the average company that it will be the direct cause of adding additional generating capacity. The total kilowatt demand on account of the diversity factor will not be noticeable on an ordinary system for some time; however, if present indications are to be taken as a guide to the future growth, the time is not far distant when the morning, noon and evening range load will be a distinguishing feature of some system charts.

The Value of the Cooking Load

The electric company in contemplating the prospective cooking load must consider it from at least three angles: 1. What is its value? 2. What must be done to obtain it? 3. What will it cost? Although electricity has been used for cooking purposes for fifteen years past, but little real development had taken place until five or six years ago, and only during two or three years has it been considered as a possibility on a large scale. Enough experience has been accumulated to indicate what effect the installation of electric ranges in quantities will have on the load, demand and income of a central station company. Regarding the desirability of the load, there seems to be little doubt. The diversity factor is very large, and for that reason the peak is relatively small, when the size of connected load is considered.

It has been demonstrated that peak loads from cooking usually fit into the valleys of the day industrial loads. Because the majority of people take their principal meal in the middle of the day, the highest cooking peak usually occurs between 11.30 a. m. and 1 p. m., during which period there is always a sag in the curve of the commercial load. The morning cooking peak comes at a time when such a demand is most desirable. The evening cooking peak is the one to consider seriously, as at certain times of the year this load must overlap the lighting load, and with the majority of companies increase the annual peak. This is where the value of a large range load is apparent, as the diversity factor is great. It is fair to assume from past experience that where the ranges in use upon a system are counted by hundreds or pass the thousand mark, not more than 10 per cent of the connected load will be on the lighting peak at any time.

In a second installment of this article, Mr. Kennedy will show by figures and load-curves the significance of the electric-range load with respect to central-station output and load factor.

Process for Drawing Lamp Filaments

A Japanese invention which is for a process for cold-drawn metallic filaments is made the subject of patent No. 1,201,611 by Kwan Nishimoto of Tokyo, Japan. Forming at first a consolidated stick of a mixture of tungsten and a small proportion of thorium, an alloy is obtained by uniformly heating the mixture at a sintering temperature and then gradually keeping its temperature at dull red heat. The consolidated stick is then subjected to repeated hammering or rolling until it becomes so ductile that it may be hammered into bars, rolled into sheets, or drawn through dies into wires, much like the metals which are commonly treated in this manner at ordinary temperature.

Export Opportunities in a European City

Markets for American Electrical Manufacturers in Barcelona, Spain, Where the Central Station Companies Have Had Boom Times and the Stocks of Supplies and Apparatus Are Depleted

BY H. S. FOLEY

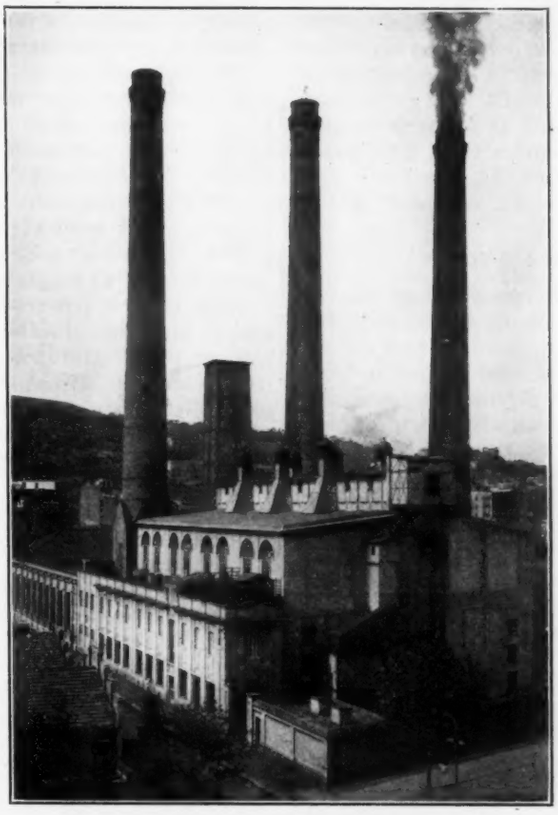
BARCELONA is the largest city in Spain and also enjoys the reputation of being the most progressive. It has been called the Manchester of Spain on account of the importance and variety of the industries which it has developed, and its people are commonly referred to as Yankees because of their shrewdness and thrift. Like many other European cities it is bilingual, Spanish (Castillian) being the official and formal business language, while for their more familiar intercourse the people prefer Catalan, as the tongue of their virile forefathers is called.

As a port, Barcelona is exceptionally well situated from a geographical point of view for world commerce, and its natural advantages have been largely developed by the many steamship lines which radiate to all of the important Mediterranean ports as well as to Buenos Aires, Havana, Vera Cruz and to the Philippines (via Suez). There will soon be three regular sailings monthly to New York and freighters are constantly unloading wheat and cotton from Galveston, New Orleans and other American ports. The harbor facilities are good, superior to most European ports. There are several railway lines which link the city with the interior and France.

Grapes, olives and cork are the principal agricultural products, although a variety of other crops are grown in a minor proportion, and for local consumption. Among the industries, textile mills predominate, but there are great iron and steel works, flour and cement mills, tanneries and many others. A large and modern automobile factory turns out machines which supply a large percentage of the local market and are favorably known all over Europe. Two factories turn out a good quality of insulated wire and underground cable; they are greatly favored by a protective tariff.

The power market is divided between two companies, a negligible part being supplied by one of the two gas companies, which operates also a small steam plant, and proposes to develop a water power in the near future. The Ebro Irrigation & Power Company, Ltd., transmits energy from its hydroelectric plants, whose present capacity is 75,000 kw., to Barcelona at 110,000 volts. At Barcelona it is stepped down to 25,000 and 6000 volts for distribution in the city and to the other cities of the province. The primary system in the city is all under ground. Service lines are under ground in the central portion of the city, the voltage being 110/220 on the direct-current network and 125/220 (four-wire) alternating current. The Energia Electrica de Cataluña transmits 20,000 kw. to Barcelona at 80,000 volts, distributing at 22,000 and 11,000 volts, service lines being at 125/220 volts. The Ebro company maintains a 40,000-kw. steam reserve and the other company 20,000-kw. reserve capacity.

SEROS PLANT, 50,000 HP.—ONE OF SEVERAL PLANTS WHICH FURNISH ENERGY TO BARCELONA



BARCELONA COMPANIES ARE INCREASING THEIR OUTPUT —STEAM PLANT OF 50,000 HP.

Recently the phenomenal increase in the price of coal forced the gas companies to increase prices by about 40 per cent, the electric companies having greatly profited thereby, especially as they took advantage of the occasion to drop their heating rate simultaneously from 25 to 15 centimes (about 3 cents), and pledged themselves at the same time not to raise their lighting rates during the current year. The lighting rate is 60 centimes (about 12 cents) per kilowatt-hour. As a result there has been something of a boom in the electrical business, which has led to the depletion of the stock of electrical supplies; this stock must have been enormous as it was practically all of German origin, and although, of course, there have been no imports from Germany since the war was started there is still a considerable amount on the market.

SERIOUS SCARCITY IN SUPPLIES

The scarcity in wiring supplies and apparatus is rapidly becoming serious. The demand is more especially for sockets, snap switches, fuse blocks and plugs of the cheap type in common use in the Latin countries.

At least one American manufacturer has begun to produce sockets suitable for this market; these have commenced to arrive in Barcelona, and a steady sale is assured if shipments can be continued. This manufacturer has faithfully copied a German model, except that he has used slightly heavier brass, turning out a better made article, which the supply houses are able to sell at about the same price as the German-made article. This shows what our manufacturers can do when they put their minds to it. It will now be necessary for them to turn out a cheap snap switch, as the supplymen do not seem to be able to sell the ordinary American switch at a price satisfactory to their customers, although otherwise it seems to be acceptable.

In developing a line of supplies for export trade there are three rules to be borne in mind which will cover nearly every case. The first is to forget the underwriters' rules, which do not apply outside of North America, and no one of which is meant to reduce cost of production. Weights must be reduced in every possible way and no slips may be permitted. Thus, while glass covers on watt-hour meters are furnished in the United States at the same price as the lighter metal covers, the foreign buyer will appreciate it if he is given a chance to state his preference, because if he has figured freight and duty with light covers and then finds that someone has substituted heavy glass covers, he will certainly not pass it over easily. Some manufacturers like to put out their goods in neat individual cartons; this may be done also for the foreign market, but it will be better to ship in bulk (barrels or cases), with the folded cartons boxed separately. The goods can then be put into packages by the receiver. The saving in this case will be in space occupied in the steamer.

CLOSER DESIGN TO SAVE WEIGHT

This question of weight means much closer design than our people have ever dreamed of, and implies the elimination of cast iron wherever possible and its replacement in some cases by pressed steel or even pressed paper. A manufacturer of electric irons might arrange with some shop in Barcelona to make the castings and nickel them and fit them with heating elements and cords supplied from America. In view of shipping conditions, the present demand could thus be more easily met and a better profit made, and the iron could be put on the market at a price that would greatly increase its popularity. The third and last rule is to give foreign buyers what they want, especially in appearance; in other words, to make the article look like what they have been accustomed to seeing. For instance, the Germans have accustomed the people of these countries to see the energy carrying parts of fuse blocks tinned; this difference in American fuse blocks is the first thing which is pointed out, and for a time in Barcelona it caused their use to be prohibited. Our fuse blocks do not work in well with the Bergman tube, which is in common use where German commerce has been dominant. German fuse blocks are ordinarily provided with a pressed paper cover, which protects the end of the Bergman tube and hides the contacts. Only the fuse plug projects through, and it is practically impossible to get a shock. A few panelboards and fittings have been received, but they are not understood; steel conduit installations are rare.

The stocks of Bergman tube are practically exhausted and the inferior substitutes (if they are possibly inferior), which are made locally, are insufficient to cover the demand. Possibly it would be a good time for Americans to introduce concentric wire. In ordinary wire and cable it will be difficult for our people to compete on account of a protective tariff. American cord for domestic apparatus and other special cord is far superior to the European product, and this fact is not at all unknown. Some of the non-metallic flexible conduits would probably find instant favor as a substitute for Bergman tube.

POWER COMPANIES GAIN CUSTOMERS

Since the beginning of the war the price of steam coal has advanced from around $6 per metric ton to $30 and $35, and it is hard to get. This has forced many factories to give up steam drive and become customers of the power companies. As coal stocks run out other factories are following, but they are now handicapped by a dearth of motors; second-hand motors are worth as much as new motors were before the war. Wound rotor induction motors are the type most generally used, squirrel-cage motors above 1 or 2 hp. being usually barred by the central stations, except when special permission is given. Water rheostats are frequently supplied for starting in order that the price may be shaded. Single-phase motors, excepting in the smallest sizes for fans and similar uses where the connection must necessarily be monophase, are practically unknown, their excessive weight proving too much of a handicap. The frequency in Barcelona, as indeed throughout the rest of Spain, is 50, and motors are usually supplied low tension, 220 volts—6000-volt motors being scarcely ever used.

The increasing cost of labor will undoubtedly force the modernization of many factories in Barcelona, and many processes which are now permissibly carried on by hand will become unprofitable shortly and will inevitably be displaced by automatic and, let us hope, motor-driven machines. In particular there would seem to be a great need of presses, punches, etc., and that class of machinery which is used in making small metal articles, such as buckles, belt clasps, etc.

With electric power so cheap in Barcelona and with coal so high the situation would seem to be ideal for the placing of electric furnaces in the various steel and iron foundries. If gasoline at 30 cents per gallon makes people in America think seriously of electric trucks, what would they do if they paid 20 cents per liter (1.056 United States quart). The port, wharves, etc., would seem to offer a splendid opportunity for the placing of unloading machinery, trucks and similar manufactures.

In conclusion it would be well to point out that whenever possible the representation of American companies should be placed in the hands of Americans, who understand the merits of the goods which they handle and who have interest and pride in the extension of American trade.

Large Hydroelectric Development in France

Owing principally to the price and scarcity of coal France is rapidly developing all available water powers. In the one district of Grenoble seven plants of a total of 47,400 hp. were in the process of being constructed; construction on seven plants totaling 98,000 hp. was about to begin and eleven plants are projected, having an aggregate rating of 164,000 to 363,000 hp.

Other districts in France have just as ambitious hydroelectric programs. Industrially, France is awakening and hydroelectric power is felt to be the solution of the power supply. All of this development will call for large quantities of machinery which neither France nor England is now in a position to provide. It is, therefore generally felt that since practically all of it will be imported it will mostly have to be made in the United States.

THE HUNTINGTON, IND., UTILITY GROUP HAS BEEN MADE ATTRACTIVE BY FLOWERS AND FOLIAGE

Planning the New Central Station Office Building

When a central station executive decides to build a new office home for his company, he usually faces what is to him a new type of problem. His first thought, perhaps, in planning is to look about him and see how others who have built well have made their central station offices. He travels about his state and neighboring states, getting one idea here and another there. Then he helps his architect plan. The new home of the Huntington (Ind.) Light & Fuel Company is a building constructed after such a tour of inspection that reached from coast to coast. It is thought by its builders to embody the best ideas from everywhere, plus some originality.—EDITORS.

IN planning its plant buildings and grounds the Huntington (Ind.) Light & Fuel Company did not neglect that other duty of all good utility companies and citizens. It tried to add to the beauty of its city. The art of the landscape gardener was effectively brought into use.

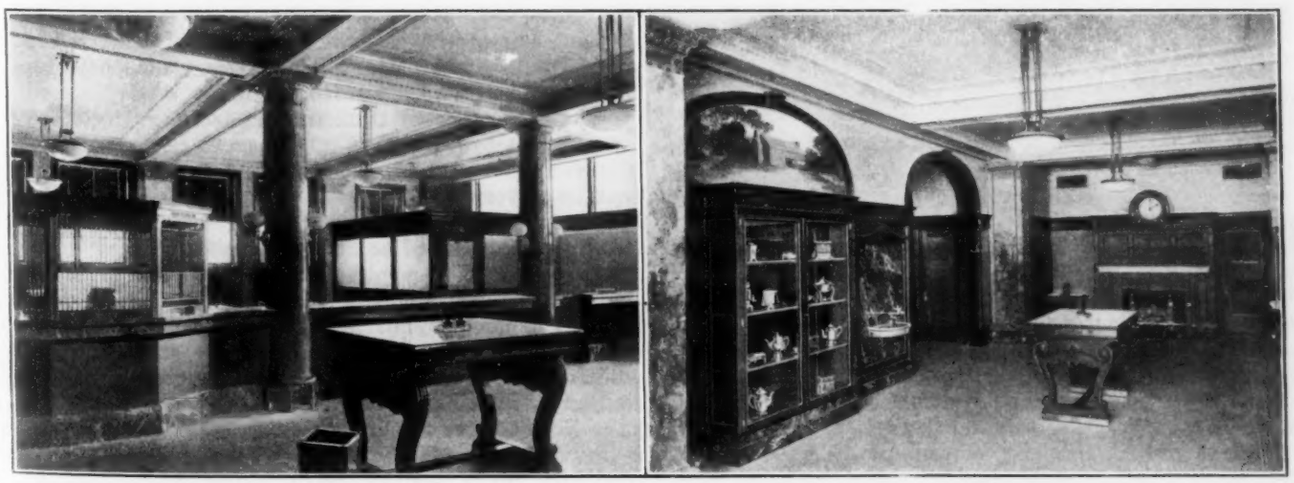
More recently there was added to the Huntington utility group a handsome administration building, which is a completely equipped and elegantly appointed example of what a central station office building can be, thanks to the personal interest of J. F. Bippus, president of the company, who has devoted much care and study to the planning of the structure.

With its flower boxes and its tapestry-brick exterior, the new office building presents the best "front" of any Huntington business structure. And its interior, adorned by mural paintings, furnished with carefully matched golden oak and finished with marble pillars and application counter, is even more attractive. It gives the visitor an impression of dignity and of the solidarity of the institution, without presenting that cold and costly appearance which much marble without the warmer golden oak might give.

The interior layout on the first floor front has been arranged so that customers entering to pay bills pass the application counter on the way to the cashier's cage. As they turn away from the cage, they come face to face with the entrance to the salesroom, through which they may again reach the street. The ladies' rest room, finished and furnished entirely in white, is just a little to the rear of the cashier's cage, on the way between the office and salesroom. In the salesroom only the more sightly appliances are on view, others being kept in closed drawers. The only appliances shown in the office room are under glass in a wall case. Most of the appliances in the salesroom are kept under glass also. The office of the secretary of the company, who is the executive in the absence of the president, is at the front of the building where, from the street, customers can see through the large window whether he is in or not.

THE HOME MAKERS' LIBRARY

Perhaps the most unusual feature of the whole building is the reception room and home makers' library on the second floor. This is a spacious room, well lighted with floor lamps and calcite glass fixtures. Its bookcases contain the best-known works on domestic science and kindred subjects. The current issue of nearly every woman's magazine is always kept on its table. It is designed to be the woman's room of a utility plant that supplies home wants. It is always open free of charge to individuals, to women's clubs, to social gatherings and to anyone who will use it. The arrangement of



NO BILLS ARE SENT OUT TO CUSTOMERS AT HUNTINGTON. INSTEAD, WHEN THE MONTHLY ACCOUNTS ARE DUE, AN ADVERTISEMENT TO THIS EFFECT IS PRINTED IN THE LOCAL PAPERS, AND THE CUSTOMERS CALL AT THE OFFICE HERE PICTURED, WHERE THE BILLS AWAITING THEM ARE FILED AT THE CASHIER'S DESK

the room and its furnishings were planned in harmony with the company's idea of service.

The comfortable apartment of the building's caretaker, the laboratories for electrical and gas testing, locker rooms with baths, and a lunch room for employees are also on the second floor.

The first floor rear, devoted to the superintendent's private office, the storeroom, the first-aid hospital and the garage, is laid out so that the plant force need never pass through the front office and store. A system of halls, doors and bench windows permits the plant force to enter from the rear, pass reports to proper departments, and communicate with the front office without entering the room.

In the company's accounting department an extraordinary effort has been made to keep the room free from small filing cabinets, card-index cases and the like, since the presence of such equipment on desk tops or on shelves was thought to detract from the appearance.

THE STOCK ROOM IN THE NEW HUNTINGTON OFFICE BUILDING

The accounting room, being just back of the application desk, is in view of all visitors. To overcome the difficulty, the drawers of the flat-topped desks have been brought into use.

All card files carrying meter records, work orders and time are kept in the drawers, as shown in the accompanying pictures. The cards in the desk of the man in charge of work orders and timekeeping apply to five different kinds of work orders, namely, electrical work orders for the company's three towns of Huntington, Markle and Andrews, and steam-heating and gas orders. A considerable saving in expense and increase in convenience has been made by having all work-order cards alike and designating them from each other by rubber stamps. Cards of five colors were formerly used.

No Bills Sent Out to Customers

The cashier's cage, where 6000 accounts are handled monthly, is operated on a plan which is peculiar to Huntington and which is not used elsewhere so far as is known. When the bills for electricity, steam and gas are made out and are due, an advertisement stating that accounts for utility service are now payable is inserted in the newspapers. All of the bills are put in the indexed sectional file in the cashier's cage. No bills are sent out. Ninety per cent of the customers come in and pay in answer to this notice. When the remaining bills are a few days overdue notices are sent to the tardy customers. With this low-priced billing and collection system, the company's percentage of uncollectible accounts is very small.

Inasmuch as a single customer may have three bills—one for electricity, one for gas and one for steam heating—the letters "G" or "S" are included on the addressograph plates which make the bills. By means of these letters the cashier picking out the electricity bill can see that there is a gas and a steam bill for the same customer in the file, and can present all three of them at the one time.

To give the reader a correct impression regarding the Huntington company, and to show that the conditions under which it has been boosting for a local city beautiful are not far different from those that exist elsewhere, it should be said that its electric rates, gas rates and steam-heating rates are in line with those of the average Indiana company of its size. Its annual output of the three commodities sold in 1915 was: electricity, 4,014,000 kw.-hr.; gas, 60,000,000 cu. ft., and steam heating, 60,000,000 lb. of condensate. The total of its electricity customers in all three towns is 4933; its gas consumers number 2650, and its heating patrons 153. In its electric power load the company has 3495 hp. connected.

The Advertising Appropriation of the Central Station

In an address before the Southeastern Section of the National Electric Light Association at Tampa, Fla., on Nov. 15, J. C. McQuiston, manager of the Westinghouse department of publicity, Pittsburgh, Pa., emphasized the importance of advertising to the central station.

"In the first place," said Mr. McQuiston, "the central station should be known in its community. It should be known for its service, for the courtesy of its representatives in meeting the public, and for all the good qualities of the organization which should not be hidden under a bushel, but should be brought in a dignified way to the attention of the people. It is so easy to assume that everybody knows about us; that they know our location; that they know what commodity we have to sell.

"There are two right ways of making an advertising appropriation—there are many wrong ways, which need no mention. Any way is wrong that does not permit of planning at least six months in advance. The two right ways of making an advertising appropriation are as follows:

"1. Appropriate a certain percentage of the annual revenue.

"2. Appropriate a certain amount for each unit of load it is planned to add to the lines.

"Of the two methods the first seems to be the more business-like. It is conservative and entirely rational, and takes account not only of the new business to be secured, but of the old which must be held. I recommend this system. The second system has, however, been successful and may often be used.

"The usual appropriation for the first system is from 1.5 per cent to 5 per cent of the gross receipts. Some of the smaller central stations spend as much as 5 per cent on advertising, while 1.5 per cent is found to be sufficient for a large syndicate. Of this 1.5 per cent, two-thirds is devoted to newspaper advertising.

"Experience and good judgment are required to get the best results out of an advertising appropriation. Every company cannot afford an advertising department; the majority cannot, but there should be appointed some one individual in every central station company—one man who is to have charge of and be responsible for the advertising. He need not necessarily devote all his time to it, but the work should be conducted on a serious, business-like basis. If the authority and the responsibility are delegated, the advertising will show results."

Electric Lighting of a "Movie" Studio

Use of Photographic Blue-Bulb Lamps in Plant of Wharton, Inc., Ithaca, N. Y.—Provisions for Flexible Lamp Location and Control of Light

BY W. E. BREWSTER

WITH the phenomenal growth of the motion-picture industry, so familiar to everyone, many details in the design of apparatus used in photoplay production have of necessity been only partially worked out. The electrical equipment of motion-picture studios has, as a rule, suffered particularly in this respect. A notable exception, however, is the equipment of the studio of Wharton, Inc., located on a 45-acre tract on Lake Cayuga, Ithaca, N. Y., where many well-known films have been made.

Most of the studio photography is done by artificial light in a one-story building, 70 ft. by 90 ft. An interior view of the studio proper, Fig. 1, shows a set being photographed which, as indicated by the floor plan, Fig. 2, was lighted by ninety 1000-watt photographic-blue-bulb Mazda lamps. These lamps with 110 others, making 200 in all, comprise the main lighting equipment of the studio. In addition there are four 30-amp. 110-volt double-carbon arc lamps, known as "broadside arcs,"

FIG. 1—"SET" IN MOTION-PICTURE STUDIO BEING PHOTOGRAPHED BY THE LIGHT OF NINETY 1000-WATT LAMPS

and two 25-amp. 110-volt carbon-arc spot lamps. The connected load of all these lamps is 219 kw. Altogether, the motors used in the carpenter shop, for pumping, etc., taken with the lamps used for general lighting, form a load of about 11 kw., making a total connected load of about 230 kw.

The carefully installed distribution system in this studio stands out as one of its most distinguishing features. All terminals are covered so as not to invite short-circuits, which might injure equipment or the personnel of the staff. The main switchboard, it will be noted, has no live points exposed on its front. The open switchwork on the back of the board is protected by an inclosure, the doors of which may be opened only by the electrician in charge.

The switchboard distributes the three-phase 120-volt current from transformers located in a vault just outside the studio. The energy is supplied at 2200 volts by the Ithaca Electric Light & Power Company, the voltage being adjusted by an induction regulator located in the transformer vault. The switchboard is connected with the transformers by 400,000-circ. mil asbestos-covered cables. Each phase is protected by two 425-amp. inclosed fuses in multiple. The energy consumed is measured by a watt-hour meter, the rate of charge being determined by a fifteen-minute maximum-demand

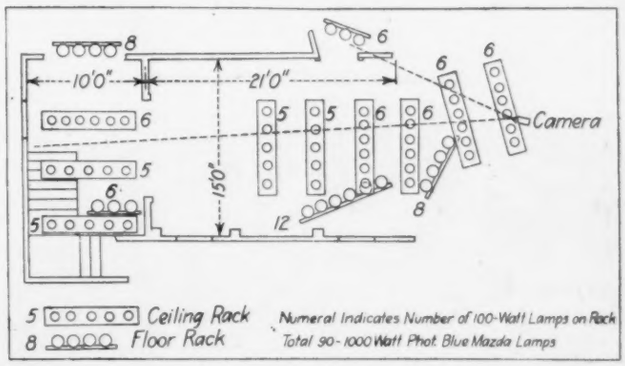


FIG. 2—LAYOUT OF LIGHTING UNITS SHOWN IN SET IN FIG. 1

indicator. The usual monthly consumption is from 20,000 to 25,000 kw.-hr.

There are eight principal branch circuits, controlled by switches located along the bottom of the board and six minor circuits controlled by switches located at the top of the board. Each principal branch circuit is protected by a 350-amp. inclosed fuse on each side of the line. These switches are in turn connected by No. 0000 asbestos-covered cable with wall boxes located about 4 ft. above the floor at various points around the studio. A photograph of one of these boxes is shown in Fig. 3. On a panel in the box the branch circuit is divided into

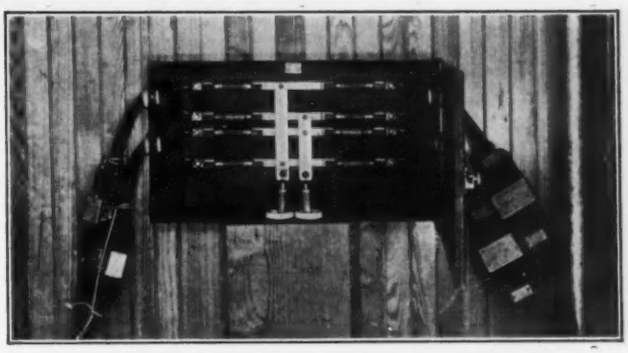


FIG. 3—ONE OF THE WALL OUTLET BOXES

four circuits, each of which is connected to a plug receptacle of 100-amp. rating. Each side of the line of these circuits is protected by a 100-amp. inclosed fuse. The circuits of three of these panel boards include water-barrel rheostats.

The efficient operation of a motion-picture studio demands a lighting equipment which is highly flexible. Experience has shown that special work like trick photography can be done to advantage in a studio equipped with incandescent lamps, because of the flexibility of

such equipment and the preciseness with which the intensity of light may be controlled by rheostats.

The 200 1000-watt Mazda lamps used in the studio are mounted on floor and celling racks of the types shown in Fig. 4. The rear view of an eight-lamp floor rack given in Fig. 5 is typical of all the floor racks. The rack is equipped with a switch cabinet containing a double-pole switch and two 10-amp. plug fuses for each lamp. These switches are all connected to a single 100-amp. plug. The photograph shows this plug attached to a No. 2 stage cable, the other end of which is attached by a plug to a wall box. These stands are rugged in construction, and are so designed that all eight lamps may be moved vertically through a range of several feet, and so that either row of lamps may be turned in a vertical plane through an angle of about 90 deg. However, experience in this studio indicates that when located as shown in the photographs the lamps are in the best position for lighting regular sets, and the adjustable features of the rack are therefore rarely used. The rack is equipped with large rubber-tired

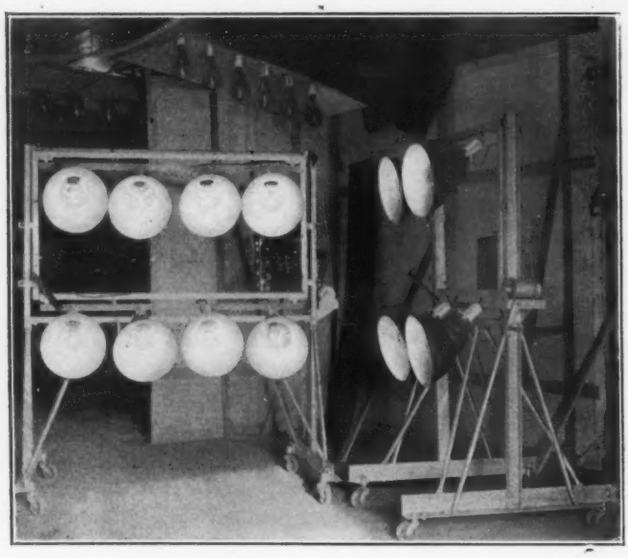


FIG. 4—FLOOR AND CEILING RACKS FOR LAMPS AND REFLECTORS

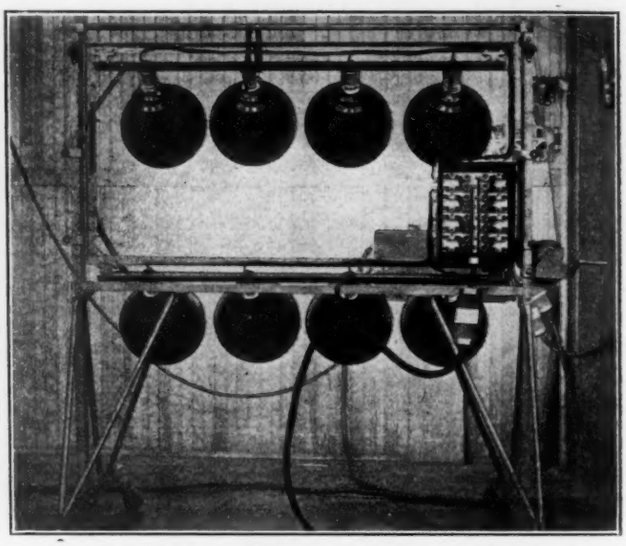


FIG. 5—REAR VIEW OF ONE OF THE EIGHT-LAMP FLOOR RACKS

casters and weighs in the neighborhood of only 200 lb., so that it may be easily moved about the studio by one man, who can readily pass it over the stage cables or other obstructions.

The overhead racks consist of trough reflectors made of galvanized iron. Each lamp is protected by a knife switch and 10-amp. plug fuses similar to those used on the floor racks. The ceiling racks are mounted in pairs on a light steel frame, which holds them about 3 ft. apart. This frame is supported at the center by light block and tackle from trolley wheels which run on rails attached to the ceiling. Through the medium of this trolley system the overhead racks may be readily shifted about the studio.

The equipment of the studio includes twenty-one ceiling racks, seven of which are equipped with five lamps while the remaining fourteen are equipped for six lamps each. There are eleven floor racks of the design already illustrated. Two of these racks are equipped for four lamps, three for six lamps, five for eight lamps, and one for twelve lamps. There are, besides, two racks requiring six lamps each and a single lamp stand, which are of special design for use in places where it is impracticable to use the larger racks. The two six-lamp racks are so constructed that they may be readily taken apart, and are therefore suitable for use outside the studio.

Eighty 1000-watt Mazda lamps were used to light the set pictured in Fig. 6. Any uncomfortable effects of high temperature that might be expected from the dissipation of so much energy are practically eliminated by burning the lamps for only short periods at a time. In the Wharton studio the lamps are rarely left burning for more than five minutes at a time, so that they do not have time to heat up the air of the room noticeably. In the "directing" of a set one or two lamps are turned on simply for purposes of general illumination. The director rehearses the scene by this light until he is satisfied with the action. He then calls for "Lights." All of the lamps required are instantly thrown on. In a few seconds the action begins, the photographer starts cranking his film, and in from one-half to three minutes the action is finished.

The special blue bulb of the lamps cuts the luminous intensity of the light down to one-third of what it would be with the clear bulb without reducing appreciably its photographic power. This, together with the fact that the contrast and hence the degree of glare is reduced by having so many sources of similar intensity all in the same plane, results in the glare effect being comparatively unnoticed.

Perhaps one of the most striking instances which demonstrate the lack of any particular discomfort due to glare or heat occurred last summer when the people of Ithaca were invited to the Wharton studio for a ball. The entire studio was used and illuminated with 200 1000-watt lamps and two 30-amp. broadside arcs. The broadside arcs were used to illuminate the principals, who were photographed with the ball as a background. The visitors were informed that pictures would be taken of the ball some time during the evening. They were not notified exactly when, and the ball proceeded and was over with only a few of them knowing when the pictures were made.

Arc lamps are used in this studio on occasions to secure a large volume of light on a comparatively small area or through a comparatively narrow opening. Arcs are also sometimes used outside of a window in a set to produce the effect of sunlight streaming in.

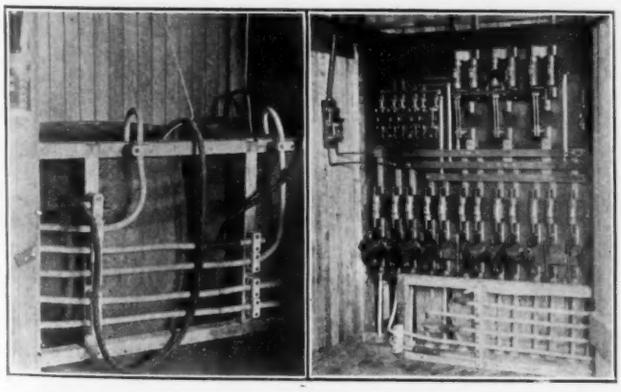
In lighting up a bank, court room, or any other such scene outside of the studio, it is obviously impossible to connect all of the lamps directly to the lighting circuits in the building. To take care of such work a transformer is placed on a truck and connected directly to the 2300-volt primaries of the lighting circuit at the nearest available point to the room to be lighted. Heavy

stage cables are run from this transformer in through a door or window of the building to portable plug receptacles known as spider boxes. The equipment of the studio includes two of these spider boxes, one capable of taking four 100-amp. plugs and the other six 100-amp. plugs. The two six-lamp collapsible racks together with ceiling racks are generally used for this class of work since they are the most readily portable part of

FIG. 6—TO MINIMIZE THE EFFECTS OF HIGH TEMPERATURE, THE LAMPS ARE TURNED ON ONLY WHILE THE PICTURE IS BEING TAKEN

the lighting equipment. These racks are connected directly to the spider box with the usual cables.

The average no-load voltage in the studio is about 120 volts. The actual socket voltage during operation ranges from 110 to 115 volts, according to the loading of the circuit. Continuous records of the voltage are kept by means of a Bristol recording voltmeter. Since the lamps used are rated to give 1000 hours' life at 105



FIGS. 7 AND 8—WATER RHEOSTATS AND SWITCHBOARD

volts, they may be expected to give from 300 to 600 hours' life at this operating voltage. The apparent disadvantage of shorter life is offset by the higher voltage. The advantage of overvoltage burning is so well established that studios in various parts of the country burn their lamps anywhere from 10 to 30 volts above the voltage at which they are rated on the basis of a 1000-hour life.

Credit for the excellent electrical and mechanical equipment of the studio is due to Mr. LeRoy F. Baker, master mechanic for Wharton, Inc.

LIGHTING A SMALL TOWN

Cost of Installing Equipment, Method of Supporting Lamps and Comparison of Old and New System at Titusville, Pa.

Very favorable impressions have been received from the installation of series gas-filled lamps for street lighting service at Titusville, Pa. The old system consisted of Wood double-carbon open-arc lamps and some series incandescent and gas-filled lamps supplied with energy from a Brush arc machine. The present system, which includes the equipment tabulated herewith, was adopted after a study of the results obtained with series and multiple units. In this investigation 9.6-amp. nitrogen-filled units were connected in series with some of the old open-arc lamps. With this arrangement, the incandescent lamps were subjected to very unfavorable conditions due to the arc lamps sticking and producing current surges. Despite this severe test, some of the gas-filled lamps operated for eight months without attention or renewal. Although very satisfactory results were also obtained with multiple gas-filled units, the series system was adopted because it did not require radical changes in the existing distribution system and for other reasons.

SERIES GAS-FILLED STREET LAMP, USED AT TITUSVILLE, PA.

In the new system, which includes 150 400-cp. lamps and twenty-eight 600-cp. units, the larger lamps are placed at points where the traffic is dense and the shade deep. One hundred and twelve units are supported on mast arms and the remainder on center suspensions. Formerly, cables were used to support each lamp, but this has gradually been replaced by No. 3 Oneida chain, until now all are so equipped. Some of the chain has been in service seven years without showing break or deterioration.

The use of reels for raising lamps has also been discontinued. As a substitute, galvanized iron half cleats have been attached to each pole, with the points downward, so galvanized-iron rings linked to the lamp chains can be hooked thereto. The weight of the fixture is sufficient to secure the ring in place against any ordinary effort to unhook it. To minimize the unauthorized handling of the hoisting equipment, the cleats are placed as high on the pole as can be conveniently reached, and a window cord with a snap hook is used to lower the fixture. With this arrangement only about one-half of the amount of chain formerly used is required, resulting in a much safer support and a neater appearance. Since the new fixtures are somewhat lighter than the old ones, and do not have to be lowered usually more than five or six times annually, the strain on the supporting equipment is considerably decreased. To make the entire overhead equipment more substantial and sightly, and at the same time facilitate raising and lowering of the lamps, the old wooden and pipe mast-arm sets

have been replaced by "Pierce" galvanized-iron arms 6 and 8 ft. in length.

All lamps burnt out are replaced at once if reported prior to 9 p. m. The reporting of lamp outages has been greatly facilitated by instructing policemen and firemen and all city employees to give the exact location of burned-out lamps as soon as discovered. Citizens are requested to do the same. Data regarding the lamps are kept in card index files, a blank card from which is reproduced herewith. From a study of past records kept on these cards, made after the system had been in operation 252 nights or 2520 burning hours, it was found that 21 per cent of the lamps originally installed were still in service, and showed no marked depreciation in efficiency, despite their having been guaranteed for only 1350 burning hours. The majority of these lamps were 600-cp. units, indicating that the larger units have the longest life. Ninety-one lamps exceeded the guaranteed life by a total of 64,890 hours, or an average of 713 hours each. Eighty-seven lamps fell short of the guaranteed life by a total of 20,680 hours,

METHOD OF MOUNTING SERIES GAS-FILLED STREET LAMP, TITUSVILLE, PA.

an average of 237 hours each. This analysis covers all short-hour lamps, defective or otherwise.

Since the new fixtures are somewhat shorter than the old arc-lamp fixtures, they hang closer to the pulley, thereby raising the source of light somewhat. The average elevation is 25 ft., although this figure has been exceeded or decreased at a few points. At this height the refractor shades project the light practically to the center of the blocks, which are slightly more than 400 ft. long. In the alleys the lamps are hung midway between the blocks. Owing to the double loop suspension afforded by the use of the absolute cutouts in connection with the fixtures, they always hang plumb.

In addition to installing the regular street lamps, an attempt was made to encourage the use of ornamental post fixtures in the business district by installing three single-lamp posts with diffusion globes in front of the city hall and one in front of the public library. The use of natural gas for illuminating the waterworks plant has been discontinued and electric service substituted. Another improvement made about the same time was the provision of a chemical rectifier for charging storage batteries on the fire alarm system. This apparatus, which has been in operation several months, eliminates the necessity of a motor-generator set, requires very little attention and has been furnishing excellent service. The saving in energy expense alone has been said to be $8 a month.

While the fixed expenses of the new system, such as salaries, maintenance and operation, average about the same with the old system, the wear on lamp suspensions has been considerably reduced and there is a perceptible reduction in the quantity of coal consumed during the operation of the lamps. With the old system, two men at $2 a day each were required to trim the arc lamps. Including occasional extra help, the labor therefor amounted to about $1,500 a year. The supply of carbons, globes, repair parts, brush copper, and the constant overhauling and adjustment of the fixtures cost $1,500, as near as can be estimated. These items have been eliminated, however, with the new system, since the annual supply of lamps has been cared for by the

ITEMIZED COST OF EQUIPMENT AT TITUSVILLE, PA.

GENERATORS AND EXCITERS. Two 900-r.p.m., three-phase, 60-cycle, 2400-volt revolving field, belted type Westinghouse alternators; and two 1000-r.p.m., 125-volt, compound wound, multipolar belted-type exciters having 25 per cent higher rating than required by the alternators.	$2,050.00
CONSTANT CURRENT REGULATORS AND TRANSFORMERS. Three 30-35-kva., single-phase, 60-cycle, constant-current regulating transformers, with 2400-volt primaries and 6.6-amp., air-cooled secondaries.	1,200.85
SWITCHBOARDS AND EQUIPMENT. Complete station and substation switchboards equipped with all necessary instruments, switches, etc. (Westinghouse.)	1,100.00
STREET FIXTURES AND CUTOUTS. 180 series incandescent street fixtures (Adams Bagnall Abolites) equipped with General Electric absolute cutouts, 20-in. concentric-ring reflectors, and 8.5 in. double-prismatic refractors. Fixtures and cutouts both wired with 18 in. of No. 8 high-tension stranded wire, and furnished with four brass-wire connectors having brass screws.	1,870.00
LIGHTNING ARRESTERS AND POSTS. Lightning arresters for station and substation complete, and four cast-iron ornamental single-lamp posts. (Westinghouse and Cutter posts.)	447.28
LAMPS. Two complete installations of 6.6-amp., 400 and 600-cp. nitrogen-filled lamps, and 200-watt multiple lamps for post fixtures. (Colonial.)	1,107.98
INSTALLATION, including inspection, supplies readjustment of these circuits to balance the phases, labor, building out for new lights and the removal of old system.	1,214.27
Total	$8,990.38

contract which calls for their replacement. So far the records indicate that the replacement of lamps will not exceed $1,600 a year. The city electrician now attends to the entire system, excepting the station, additional help being employed only for heavy repairs and building lines for new lamps. These arrangements have permitted an annual saving of $1,400 a year aside from that represented by the improved fuel economy, the more efficient method of charging storage batteries, and lighting of the waterworks, which can be estimated at a total of $2,000 annually.

Between the award of the contract and the arrival of the new equipment a new brick and concrete substation was erected in the center of the city large enough to accommodate the street lighting switching and voltage control equipment, and also an office for the city electrician. The building of the substation was more than paid for by the sale of old equipment removed from the street lighting system and sold for scrap. The generating equipment was installed in the city waterworks building, where a 175-hp. Russell steam engine was used to drive the generators.

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

RANGES IN NEW ENGLAND

Special Electric Cooking Rates Now Offered by Fifty-three New England Companies

In a paper before the New England section of the N. E. L. A. at the recent Pittsfield (Mass.) convention, A. L. Smith, Jr., of the Edison Electric Illuminating Company of Boston reviewed the progress of electric-range applications in fifty-three New England central stations. Forty-five companies maintain electric cooking rates ranging from 2.25 to 5 cents per kilowatt-hour for the average family consumption, and the companies reported a total of 1605 electric ranges in use in New England. An average of twenty-four replies indicates an average cost of $1 per person per month for electric range service. Thirty-four companies sell ranges direct to customers or plan to do so in the near future. Twenty sell on a merchandising basis and sixteen companies sell at cost or below. The sale of 1200 out of the 1600 sold in New England brought a gross profit to be applied to the merchandising expense. Seven companies wire the ranges for their customers and nineteen leave the work entirely to contractors, but supervise the installation somewhat. The average cost of installation (inside wiring) is about $16 per range. Eight companies use local newspapers for range advertising.

Nineteen companies report few or no repairs or service calls from ranges as yet; eight use troublemen for these repairs, and two companies charge the customer for such services. One company reports a quarterly inspection of cooking apparatus. Ten companies recommend electric heaters of the circulating type for heating customers' water supply. High first cost, poor advertising, poor deliveries and improper boxing are named among the causes of slow electric range development, and the paper contained a detailed schedule of material used by the Boston Edison Company in boxing ranges for transportation, with a wiring table for ranges supplied from 220-volt circuits.

Fourteen companies use men with electrical training in selling ranges, and a few use women. Eighteen companies report following up sales with a demonstration. Six companies find that special drives have proved quite profitable in selling electric ranges. Regarding the range designs now on the market, twenty-four companies express satisfaction with the present equipment. Most companies recommend the size of wire to be used, and endeavor to keep the voltage drop within 2 per cent on range and other heating installations. The range meeting the average family's need sells for about $60, the average connected load being about 5 kw. Sixteen stations finance the customer's wiring and the cost of the range. Electricity at from 2 to 3 cents per kilowatt-hour compares very favorably with even the lower gas rates, and is much cheaper than some of the other forms of fuel used. The author maintained that there is nothing to be ashamed of in the present prices of electric ranges, although reductions are to be anticipated as the business grows.

The following suggestions were made by the author relative to wiring improvements desirable in electric-range installations: First, all accessible range wiring and connections should be of rigid construction, preferably in pipe or BX, with as little visible as possible; second, main-line switches controlling ranges should be of the snap or rotary type as far as possible, rigidly mounted in approved condulet or steel box, located as close to the range as convenient and not around the corner as is often the case; third, central stations should have supervision over these installations, and recommend the size of wire to be used, in order to avoid excessive voltage drop and to lessen the expense of the installation by keeping the contractor from installing twice as much copper as is necessary for good regulation. Wiring device manufacturers could easily make a complete unit for range connections which would greatly assist the central station and the contractor.

In a brief discussion which followed, C. E. Greenwood, superintendent of the appliance department Boston Edison Company, said that more than 1000 electric ranges are now in service on the system. Some attention must be given to customers to insure the best results. In one apartment house where fifteen ranges are in service the average bill was only $3.30 per family per month, the usual family having at least three persons. About seventy electric water heaters are in service. The company has sold an average of five ranges per week from its exhibition window. As many as forty ranges have been sold to a single builder.

ELECTRIC WIRING TABLE FOR RANGES

This table is taken from a leaflet which the Boston Edison Company supplies to contractors as a guide to range installations. It is computed for a 2 per cent drop in the wiring, assuming the load approximately balanced on a 110 220-volt three-wire system:

220-VOLT WIRING TABLE

	Size of Wire						
Load, Kw.	No.	No.	No.	No.	No.	No.	No.
	14	12	10	8	6	4	2
1.0	191	304	484	770	1220	1940	3100
1.5	127	203	322	513	815	1290	2060
2.0	95	152	242	385	610	970	1550
2.5	76	121	193	308	488	775	1240
3.0	63	101	161	256	406	647	1030
3.5	....	87	138	220	349	555	886
4.0	....	76	121	192	305	485	775
4.5	....	....	107	171	271	431	690
5.0	....	....	96	154	244	388	620
5.5	....	....	88	140	222	352	564
6.0	....	....	....	128	203	323	517
6.5	....	....	....	118	188	298	477
7.0	....	....	....	110	174	277	443
7.5	....	....	....	102	163	258	414
8.0	....	....	....	....	152	242	388
8.5	....	....	....	....	143	228	365
9.0					135	215	344
9.5					128	204	326
10.0					122	194	310
10.5					116	185	295
11.0					111	176	282
11.5					....	168	270
12.0					....	161	258
12.5					....	155	248
13.0					....	149	239
13.5					....	143	230
14.0					....	138	221
14.5					....	133	214
15.0					....	129	206
15.5					....	....	200
16.0					....	....	194
16.5					....	....	188
17.0					....	....	182
17.5					....	....	177
18.0					....	....	172
18.5					....	....	167
19.0					....	....	163
19.5					....	....	159
20.0					....	....	155

DIRECTIONS

1. Find total load in kw.
2. If odd value, use next higher.
3. Measure actual distance along run from load to service entrance switch.
4. Opposite load from table find smallest size wire allowable for that distance.

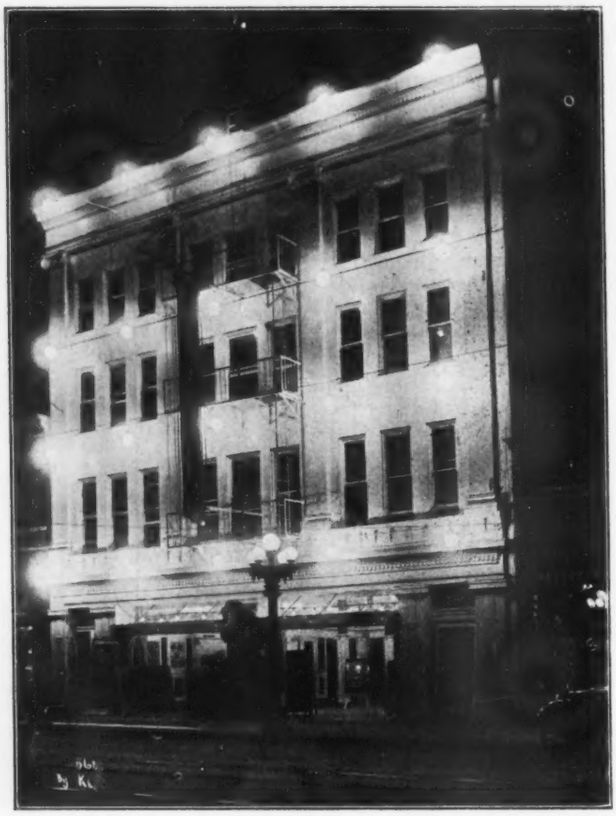
EXAMPLE

5 Kilowatts 100 Feet

Opposite 5 kw. find distance next larger, it being in this case 154. At head of this column find wire size, the result being No. 8.

Illuminated Front of Birmingham Theater

"The best advertising scheme I've ever had," is what the owner of the Majestic Theater of Birmingham, Ala., told H. M. Kohn, commercial manager of the Birmingham Railway, Light & Power Company, after the lighting installations that Mr. Kohn has succeeded in getting in his lines. After the first one was obtained the others came much easier, for good illumination proved to be "a strong puller of patrons."



BIRMINGHAM (ALA.) THEATER'S FRONT LIGHTED BY TWENTY 500-WATT LAMPS

ing shown was installed. The front of the building is illuminated by twenty 500-watt gas-filled lamps, and the letters in the sign are outlined in dark red lamps. These red letters show up well, despite the light from the Type C lamps. This is one of some twenty similar

Avoiding Monotony in Lighting

As the speaker of the evening at the first fall meeting of the Chicago Section of the Illuminating Engineering Society, Prof. Morgan Brooks of Urbana reviewed the history of lighting and offered some advanced ideas on modern illuminating engineering. He declared that the engineer should work for effects that please the eye rather than for a certain established set of measurements. As an analogy he pointed out that if a picture on the wall looks straight to the eye, it matters not at all whether it is found to be out of plumb when a spirit level is applied. Following the same reasoning, if lighting looks right it is better lighting than if it looks wrong and measures right.

Professor Brooks also urged engineers to make every effort to avoid monotony in lighting. Each job should be made the subject of a special study. He advised against employing weird effects except for advertising purposes, and dwelt rather extensively on the value of "cozy effects" in home lighting. On the so-called cozy effect it was his opinion that they are popular in the average home, and that illuminating engineers can please clients by working out such effects in an artistic manner.

A "Good-Will" Arch That Hastened the Merchants' Christmas Decorations

Shortly after Thanksgiving last year the Leavenworth (Kan.) Light, Heat & Power Company installed the "Good-Will" arch pictured herewith. Two purposes were achieved, according to C. S. Emmert, general manager: One was to express the company's good-will to the public in general, and the other was to hasten the Christmas decoration work throughout the business district, and thus give the company longer hours burning of its extra load for the holiday season.

The idea succeeded remarkably well, for in less than one week after the central station arch went up practically all of the Christmas decorating in the downtown

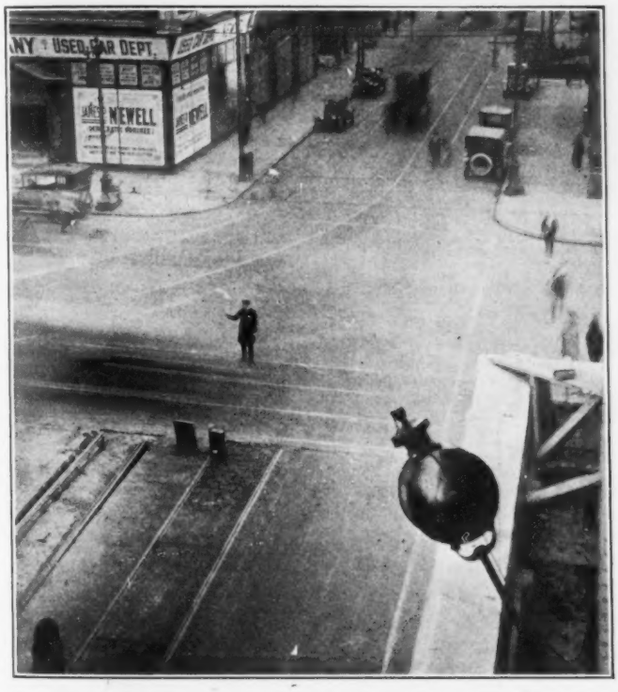
BESIDES TESTIFYING TO THE COMPANY'S "GOOD-WILL" SPIRIT, THE ERECTION OF THIS ARCH SHORTLY AFTER THANKSGIVING DAY HAD THE EFFECT OF HASTENING THE INSTALLATION OF THE MERCHANTS' ELECTRICAL DISPLAYS FOR THE HOLIDAYS

district was finished. This gave the company at least ten days extra time on all of this extra lighting, and so proved to be a profit-returning measure. To carry out this same idea during the 1916 holiday season, Mr. Emmert expects to have the arch ready to put up by the day after Thanksgiving.

Illuminating the St. Louis Traffic Policemen

The Union Electric Light & Power Company of St. Louis, Mo., is flood-lighting the traffic policemen on some of the busy corners of the city. The plan is meeting with wide local approval. The police like to be in the limelight; the automobile drivers appreciate anything that will speed up traffic, and the Union Electric Company is pleased to know that the attempt to aid the public is successful.

Last winter an effort to make the motions of these traffic directors more easily seen was made by equip-



PROJECTOR LAMP TO LIGHT TRAFFIC POLICEMEN IN ST. LOUIS

ping them with big white gloves. To increase the illumination at the busy corners, 500-watt lamps in flood-lighting projectors have been mounted on adjacent high buildings. Since the lamps are located well above the street and the beams from them are sent almost directly downward, there is no objectionable glare either in the eyes of the officers or in those of car drivers. Now that the plan has been tried out it is expected that more of the units will soon be installed.

Farm Motor Installation in Service Five Years

The electric-motor installation of a farmer near Grand Forks, N. D., has now been in successful operation for five years. The Lilac Hedge Farm, operated by J. D. Bacon, installed electrical equipment for the first time in 1911 for both lighting and power purposes. The load is connected to the lines of the Red River Power Company, one of the Northern States Power Company subsidiaries. Electric drive has been used ever since for milking and other purposes (an average of sixty cows are milked twice a day). About 1000 tons of ensilage is cut each year; all the threshing, feed grinding, wood sawing, water pumping, etc., is done by electric motors, two of which are stationary, one for driving the milking machine and one for pumping water. The rest of the farm work is done by a 35-hp. portable motor so arranged that it can be plugged in at various places on the farm. The installation has been a very satisfactory revenue producer for the central station, and has more than satisfied the owner of the farm.

Recommends that Central Stations Standardize Lines of Appliances Sold

Standardizing of electrical appliances was recommended as a central-station sales policy by A. H. Allcott of the Narragansett Electric Lighting Company, Providence, R. I., in a paper at the convention of the New England section of the N.E.L.A. The author pointed out that where several different makes of appliances are stocked, the purchasing power is limited on each line, which limits discounts and profits in proportion. "Sales are easier to make," he said, "when the customer does not have a wide range of selection, and the disadvantages of diversified receptacles and plugs are also minimized, for with one make of appliance an interchangeable cord and plug is usually supplied. The standardization of all appliances is not yet practical, but the articles most frequently used at Providence are not seriously handicapped by an additional cord.

"It is a mistake," continued Mr. Allcott, "to assume that an electric shop must be fitted up to represent a bank with marble counters, pillars and mosaic floors. Our stores to be successful should have the air of merchandising about them. Experience proves that the prospect likes to handle and inspect the merchandise in which he is interested. The loss due to exposure of apparatus to dust, etc., is very small, particularly if the goods are cleaned daily. Whatever loss may occur is offset by an increase in sales."

Good windows, changed weekly, were advised. No feature of the use of the goods displayed should be left to the imagination of the prospect. The easy-payment plan has been successfully extended to all appliances in the Providence company's electric shop, except fans and tungsten lamps, and the sales have increased over the usual rate of natural growth. All goods in the store have a fair-sized tag showing the monthly payment for that particular article, the initial payment and retail price being printed on the reverse side.

Very successful "Dollar Day" campaigns have been conducted this year, the item sold for $1 being a small portable lamp. In addition to the dollar lamp, the customers were offered $1 off on any appliance selected in the shop. In the nine-day "Edison Day," 1915 campaign, the company sold all lamps at a discount of 25 per cent, limiting each customer to five lamps. In this campaign the company sold 40,603 lamps. From 22,000 circulars sent out, 735 direct responses were received, representing the sale of 9000 lamps. All appliances, with one or two exceptions, are sold at the manufacturer's list price, and no goods are sold at cost. Customers' credit is checked without their knowledge and a cash basis of payment insisted upon when the credit is unsatisfactory. The principal advertising medium is the daily press, including the women's section of the Sunday papers. Bill inserts, theater programs, calendars, bridge scores, travelers' sewing outfits, etc., are issued bearing the Electric Shop imprint. The electric shops are looked upon and conducted as purely retail stores, and 5 per cent of the gross receipts of the stores are devoted to advertising.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Peculiar Cable Trouble Traced to Effect of Electrolysis Stopped Years Ago

A central station in the Middle West recently discovered that practically all of its cable trouble was occurring in one particular section of the city. The ducts in that district pass over a hill, and the trouble always occurred either on the hill or on the slopes leading to it. One of the company's engineers maintained that the break-downs all resulted directly from electrolysis which, in years past, had attacked the cable sheaths in that district, but which in later years had been stopped. His claim was, that when the ground currents were active, they had partially damaged the cable in many places and that the bad spots would continue to show up from time to time.

Another engineer, however, had observed drops of oil falling from duct lines where they drained from the slopes into manholes near the foot of the hill. Associating this discovery with the fact that an oily compound was used in the manufacture of the cambric cable installed, he decided that the temperature rise in the cable was driving oil out of the cambric insulation and into the ducts through perforations made in the lead by the old electrolysis currents. The insulation strength of the cable would thus be decreased as the oily compound was driven from it.

To remedy the trouble, if this analysis of it is correct, it will be necessary to replace all of the cambric cable. Before this is to be done, however, the company will install a line of paper-insulated cable over the hill and watch its performance in an endeavor to determine whether or not the latter solution of the trouble is a correct one.

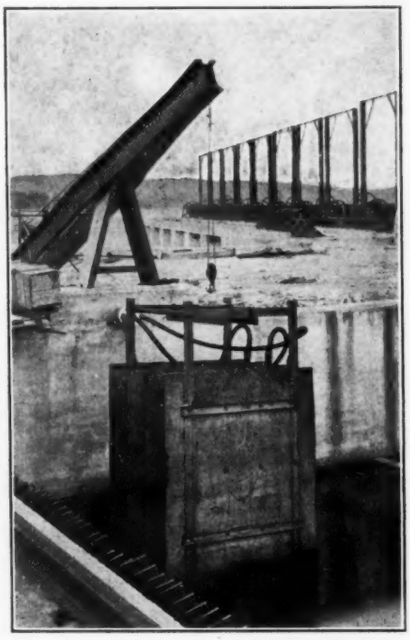
Some Hidden Leaks in Boilers

Leaks around valves, fittings and connections constitute a serious menace to the safe operation of a steam boiler, because they invariably produce weakening through corrosion. Too much care, therefore, can scarcely be given to the inspection of all joints and seams where leaks are likely to develop. Fortunately, the majority of these places are easily accessible for examination; but there are many points that cannot be reached so readily, and these are the localities in which serious troubles are apt to arise. The points where the tubes are expended into the heads, the seams in contact with the hot gases, and the connection of the blow-off pipe to the shell are some of the places that can be properly inspected only at intervals, and are therefore apt to be neglected. Moreover, they are so located that deposits of soot and cinder are likely to accumulate on them, thus increasing the danger. For, while the continuous seepage of moisture will corrode the metal, the action is greatly hastened under the effect of heat and in the presence of carbon. A still more potent source of danger is the leak that is completely hidden by the brickwork of the setting. A tubular boiler made with a dry plate may develop leakage past the rivets in the seam that holds the front head to the shell, at the point where the bottom of the shell rests on top of the firedoor arch. In this position it is very difficult to discover leakage, except by removing the brickwork. Again, the connection of the lower pipe of the water column to the boiler shell at the side involves a threaded joint concealed by the brickwork, and corrosion may go on for a long time before it is discovered. There is but one satisfactory way to avoid all trouble from external corrosion, and that is to keep all joints tight, so that neither water nor steam can leak through. Corrosion cannot take place on a dry, clean boiler plate.

Permanent Water Rheostat for Hydroelectric Plant

At the Montague City (Mass.) plant of the Turners Falls Power & Electric Company a water rheostat is installed as a permanent part of the station equipment. When originally constructed, it was to furnish a load for testing a 7500-kva. direct-driven generating unit. It has since been retained to furnish an emergency load whenever conditions should arise necessitating the immediate operation of one of the generators on the rheostat as a brake.

The rheostat, illustrated here, consists of seven iron plates. Four of them are about 4 ft. by 8 ft. in out-



WATER RHEOSTAT IN FOREBAY OF MONTAGUE CITY (MASS.) GENERATING STATION

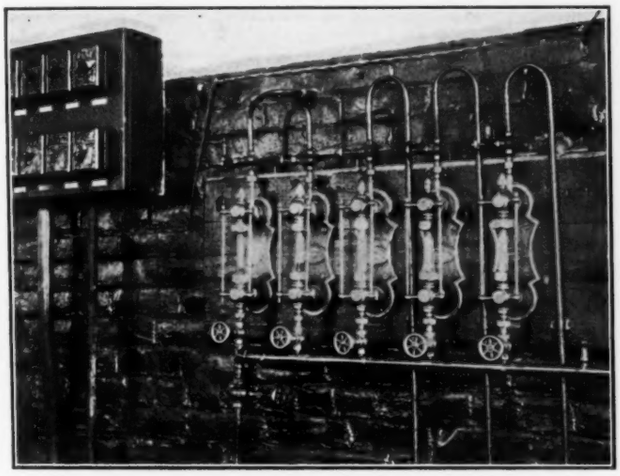
side dimensions, with all the plates built into a single structure separated by twelve horizontal insulating posts. The plates are suspended from the end of a set of I-beams about 6 in. deep, arranged in a pair braced by a triangular supporting structure near the edge of the forebay, and anchored into a concrete base at the rear. The plates can be raised and lowered easily by the use of a hand-operated winch.

A three-phase cable circuit is carried in duct from

the station to the rheostat, and any generator can be connected to the rheostat by switch manipulation with little loss of time. During a test in which about 8000 kw. was dissipated at the rheostat in the winter season, only a slight motion of the water could be observed, although after protracted runs of several hours the ice in the forebay near the rheostat was melted.

Centralizing Control of Oil Feed and Lighting Circuits

In a Massachusetts engine-driven generating station, convenience in operation has been served by mounting sight-feed oil gages and lighting circuit switches on wall panels as shown in the accompanying illustration. In the case of the oil gages, each unit is supplied with lubricating fluid through a separate pipe branching from a horizontal "bus" pipe at the bottom of the board. Valves are provided on each side of the gages. The equipment shown was designed by W. P. Phillips & Company, Boston. Adjacent to the oil lines is a station lighting panel equipped with fourteen Hart & Hegeman snap switches mounted in two rows and wired in conduit. Maximum convenience is served by these arrangements.



SPECIAL OIL GAGE AND SNAP SWITCH PANELS

How Power Plant Records May Be Interpreted

Power plant records may be classified into two groups: those designed chiefly by the plant engineer to check up operating conditions, consisting of data on coal, temperatures, pressures and the like, and those which are worked up by the operating department and passed on to an accounting department where costs of various items which enter into power costs are checked up and detail production cost reports made. The second class of records embody the salient features of the first, but are more useful both to the resourceful engineer and the executive manager.

Power plant operating expenses are made up chiefly of fuel and water costs, labor, supplies, repairs and certain overhead expense or fixed charges, which include depreciation, interest, taxes and insurance. To determine the charges, the quantities of the various materials used in producing the power must be obtained. The unit cost will then be the cost of these items divided by the total output for some definite time. It is thus clear that the records the engineer has been instructed to keep may be made to serve another purpose, which places them in a different class than those which are used simply to check up operating conditions. Information taken from the operating log sheets are of service in attaining the highest operating efficiency and the lowest possible power cost, and in crediting the engineer for his ability.

The term "unit cost" implies the acceptance of a certain time element. The usual practice in large plants is to accept the month as the basis. In the central station industry the load conditions change from month to month, and climatic conditions will affect the operation so that in making a comparison it is advisable to compare the results of one month with the same month of the preceding year rather than to compare the performance in two consecutive months.

Formerly it was quite expensive and at times impractical to obtain the data upon which to base power plant records. Within the last decade there has, however, been a great development in power plant testing apparatus, so that to-day fuel, water and many other items may be automatically weighed at a low cost. There are items which enter into the makeup of records, and which must be established by periodic tests until ac-

POWER STATION PERFORMANCE.

Monthly report for.....Station

Month of .....19..

	Current Year	Last Year	Comparison
ELECTRICAL OUTPUT			
Total kilowatt hours generated			
Kilowatt hours used in production			
Net station output			
Average daily output			
Average hourly output			
Capacity of station			
Average station factor			
Average load factor			
BOILER OUTPUT			
Average daily boiler horsepower hours:			
In service			
Banked			
Average kw.-hr. per boiler horsepower hour in service			
Average per cent of boiler rating for month			
FUEL CONSUMPTION			
Pounds of bituminous fuel used			
Pounds of anthracite fuel used			
Total fuel used			
Pounds of fuel per kw-hr. generated			
Pounds of fuel for banking boilers			
Per cent of fuel used for banking			
Total pounds of refuse from fuel			
Per cent of refuse to total fuel			
WATER CONSUMPTION			
Total water evaporated by boilers			
Pounds of water per pound of fuel (actual)			
Factor of evaporation			
Equivalent pounds of water per pound of fuel			
OPERATING DATA			
Average steam pressure			
Average superheat			
Average vacuum (corrected to 30 in.)			
Average feed water temperature			
PLANT COST			
Fuel at $..... per ton			
Cylinder oil at $..... per gallon			
Engine oil at $..... per gallon			
Kerosene oil at $..... per gallon			
Grease at $..... per pound			
Waste, etc., at $..... per pound			
Repairs, machinery			
Repairs, building			
Fixed charges			
Total for month			
Average per kw.-hr.			
REMARKS			

curate data can be accumulated. In this class would come the determination of the amount of coal used for banking and the water rates of auxiliary apparatus.

No definite rules can be established for the keeping of power plant records. Local conditions enter largely into the question, and the records obtained are generally a matter of convenience and judgment. It is obvious that where continuous records are to be maintained simplicity should be the keynote, and observations which have no bearing on the final monthly statement should be eliminated unless they are of value in determining operating efficiency.

Many plant managers insist that the engineer make certain observations, and in this way collect valuable data. Sometimes this is carefully filed away so that it becomes of little value except for reference. Curves may be drawn with the aid of this data showing the operation of the plant throughout the year at a small expense, and which often are the basis for renewal of equipment. The primary value of all power plant records is their interpretation. The mere collection and filing of data is of little use, but a small amount of data carefully collected and interpreted to illustrate the desired results will prove a good return on the time and labor spent in keeping the data.

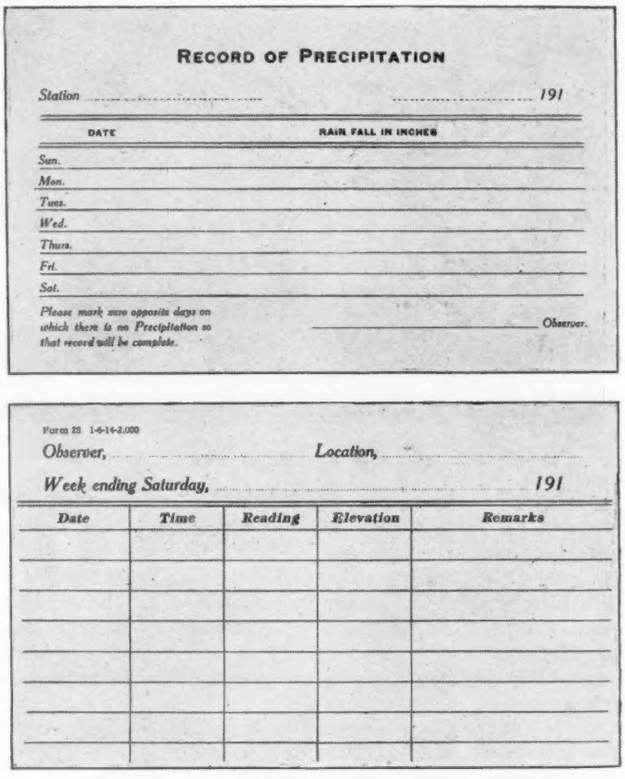
The monthly performance table shown in the illustration gives an idea of what data is essential in the general run of power plant records. Such a table can be enlarged or diminished as local conditions warrant. The advantage of such a table lies in the fact that many of the items can be placed thereon at the end of the month by the engineer, and the cost data be figured later at the office. The column at the right may be used to denote the percentage of increase or decrease over the operation for the same month in the preceding year. If these percentages are adverse to the continued efficiency of the plant, the items should be investigated and a cause and remedy assigned. Conditions will often arise which will affect the figures so as to apparently decrease the efficiency, but over which the engineer has no control. Such items as repairs to the building and the like would fall in this class.

Forms Used by New England Company for Recording Hydraulic Data from Observation Stations

In order to keep a close check on stream flow at all times the New England Power Company maintains six precipitation and nine gaging stations on the Deerfield River where five hydroelectric plants are now operated in the State of Connecticut. These gaging and precipitation stations outside the generating stations are provided with printed postcards on which data showing daily heights of water and rainfall are recorded. These postcards are mailed to the dispatching office at Millbury, Mass. The forms printed on these cards are shown in the accompanying illustration. When the rainfall reaches 0.25 in. or more during the twenty-four hours, the data is telegraphed to the dispatcher. The methods of plotting these data on large sheets so as to show hydraulic conditions at all points of the watershed and make it possible to use water most economically were explained in the article describing the load dispatching practice of the company as published in the Oct. 14 issue of the ELECTRICAL WORLD.

By the work of the load dispatching organization, the rainfall occurring at different times on the watersheds is made to benefit all the consumers on the combined systems. The interconnection of plants and control of water from a central point also permits a reduction in operating expenses and assures better service by reducing to a minimum the possibility of total interruptions at any time from line troubles or otherwise. The investment and consequently the cost of power can be reduced by combinations, because less capacity in generating machinery to serve as spare plant for emergencies need be installed, and operating expenses can be reduced by rendering repairs easier, owing to greater facilities for shutting down for work or for inspection. The union of adjacent water powers enables neighboring power markets to be more effectively interconnected, assuring steadier levels of supply and demand. The power is produced at a lower average cost to the consumer as a result of this interconnection and centralized control.

Summaries are constantly maintained of all the causes of operating disturbance. Daily reports of operation and bulletins are forwarded from Millbury to the general manager's office at Worcester, showing all important statistics of production, water flow, reservoir conditions, load factors, probable production on date of bulletin, delivery of energy in kilowatt-hours to each customer and for the month to date, steam and purchased power used, service events, and percentage data.



RECORD OF PRECIPITATION

Station 191

DATE	RAIN FALL IN INCHES
Sun.	
Mon.	
Tues.	
Wed.	
Thurs.	
Fri.	
Sat.	

Please mark zero opposite days on which there is no Precipitation so that record will be complete.

..... Observer.

Form 23 1-6-14-2,000

Observer, ... Location, ...

Week ending Saturday, ... 191

Date	Time	Reading	Elevation	Remarks

POSTAL CARD FORMS USED FOR MAILING RECORDS OF RAINFALL AND STATION GAGING READINGS TO LOAD DISPATCHER

Advantages and Disadvantages of 60-Cycle Commutating Pole Rotary Converters

In the report of the committee on power generation presented at the convention of the American Electric Railway Engineering Association at Atlantic City, N. J., Oct. 9-13, attention is called to the fact that the introduction of the commutating pole into the design of synchronous converters has so greatly extended the permissible commutation limit that much higher speeds and correspondingly greater kilowatt capacities per pole have been made possible. Commutation has in almost all cases, and particularly with 60 cycles, been the limit in the capacity of those machines. The use of

COMPARISON OF 600 VOLTS, 6-PHASE RAILWAY SYNCHRONOUS CONVERTERS

	Comm. Pole	Non-comm. Pole	Comm. Pole	Non-comm. Pole	Comm. Pole	Non-comm. Pole	Comm. Pole	Non comm. Pole	Comm. Pole	Non-comm. Pole	Comm. Pole	Non-comm. Pole
Kilowatt rating	500	500	1,000	1,000	500	500	1,000	1,000	1,500	1,500	2,000	2,000
Direct current volts	600	600	600	600	600	600	600	600	600	600	600	600
Cycles	60	60	60	60	25	25	25	25	25	25	25	25
Revolutions per minute	1,200	900	900	600	750	500	750	375	500	250	375	187½
Poles	6	8	8	12	4	6	4	8	6	12	8	16
Armature diam. (inches)	25	36	36	60	25	36	30	60	45	90	60	120
Armature feet per minute	7,870	8,500	8,500	9,440	4,900	4,700	5,900	5,900	5,900	5,900	5,900	5,900
Commutating diam. (inches)	16½	22	22½	33½	20	25	23	40	34½	60	44	90
Commutating length (inches)	12	8	18	14	14	12	26	16	24	16	26	16
Commutating feet per minute	5,180	5,170	5,300	5,220	3,920	3,280	4,500	3,920	4,480	3,920	4,320	4,420
Volts per bar	14.4	13.3	13.3	13.3	10.0	11.1	12.5	9.5	12.5	9.5	12.5	9.5
Direct current brush density	53	59.5	53	46	45	35	49	40	53	40	49	40
Collector diam. (inches)	10	12	12	28	12	19½	12	26½	22	34	28	34
Collector feet per minute	3,150	2,830	2,830	4,400	2,360	2,590	2,360	2,600	2,880	2,220	2,740	1,670
Alternating-current brush density	89	111	95	Cu. ft.	111	Cu. ft.	95	Cu. ft.	95	Cu. ft.	109	Cu. ft.
Efficiency:												
One-half load	93.1	91.5	93.9	89.9	95.5	93.9	96.0	95.8	95.2	94.6	96.3	94.8
Three-quarter load	94.8	93.8	95.4	92.9	96.5	95.6	96.8	97.0	96.3	95.9	96.9	96.1
One load	95.7	94.9	96.1	94.3	96.9	96.2	97.0	97.5	96.8	96.5	97.0	96.6
One and one-quarter load	95.9	95.3	96.3	95.1	97.0	96.6	96.9	97.8	96.9	96.8	97.0	96.9
One and one-half load	96.2	95.7	96.4	95.7	97.1	96.8	96.8	97.9	97.0	96.8	96.8	97.0
Weight (pounds)	9,500	18,500	21,000	3,500	14,250	26,500	22,000	55,500	37,000	82,000	54,000	96,500
Weight, pounds per kilowatt	19	37	21	35	28.5	53	22	55	24.7	54.6	27	48.25
Floor space (square feet)	27.8	40.3	50.5	71.0	39.0	45.5	57.3	85.5	67.1	181	143	209
Price per kilowatt	$7.80	$10.50	$6.40	$9.35	$9.00	$12.00	$6.60	$12.50	$6.50	$11.92	$6.50	$10.50

NOTE.—Temperature rise full load continuous, 35 to 40 deg. C., for 1½ load 2 hr. 55 to 60 deg. C.

the commutating pole has been supplemented by improved quality in brushes, permitting higher densities in amperes per square inch. Along with these improvements in commutation have come other refinements in design, such as better quality of iron, permitting greater flux densities, improved methods of ventilation employing the cooling effects of large quantities of air, automatically driven through the windings of a machine by its rotation and the use of better grades of heating resisting insulating material.

The accompanying table presents data compiled by the committee for both 25-cycle and 60-cycle machines ranging from 500 to 2000 kw. The data covers the principal factors which occur in the use of the commutating pole and non-commutating pole converters. From this data the following summary of comparisons of commutating and non-commutating pole rotary converters was given in the committee's report:

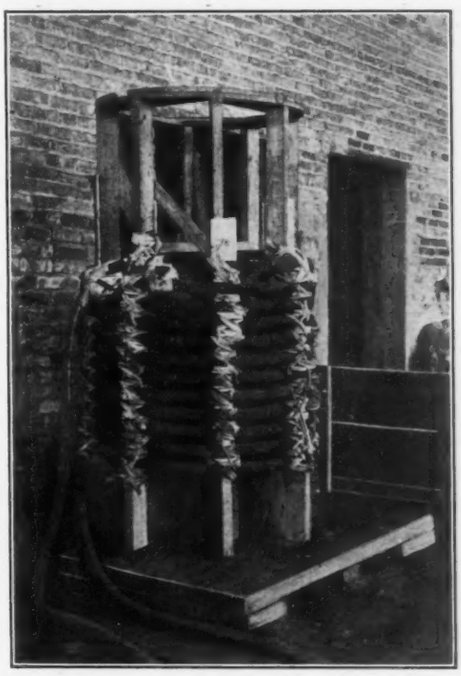
1. The speed of the commutating pole machine ranges from 33 per cent in the case of the 60-cycle machines to 100 per cent in the case of the 25-cycle machines higher for the non-commutating pole type. 2. The peripheral speed of the armature and commutator is approximately the same for both types. 3. The floor space occupied by the commutating pole type is approximately two-thirds that required by the non-commutating pole type. 4. The efficiencies of the two types are approximately the same, but slightly in favor of the commutating pole type. 5. The commutating pole type weighs roughly only half the non-commutating pole type. 6. The price per kilowatt of the commutating pole type ranges from 75 per cent in the 60-cycle machines to 50 per cent in the 25-cycle machines, of that of the non-commutating pole type.

Emergency Operation of an Electric Furnace

BY GILBERT RUTHERFORD

Not long ago the failure of a special 750-kva. single-phase, 60-cycle transformer, with 12,000 primary and 240-volt secondary, used to supply a 1-ton electric furnace load from a central station system, resulted in an emergency connection with standard equipment that besides being interesting saved the consumer a considerable loss. The transformer that failed was designed with internal reactance suitable for stabilizing the furnace arc and as a preventive against serious stresses in the transformer coils. The standard apparatus available was single-phase, 25-cycle transformers rated at 450 kw., 9000/8800 to 170 volts. It was decided to use four of these 25-cycle units on 60 cycles by connecting two in series and two in parallel.

Since the transformers were of standard design and had no special reactive characteristics other than that due to the leakage, the special home-made reactance coil, shown in the accompanying illustration, was made up and installed between the secondaries of the transformers and the furnace electrodes. This coil was made 3 ft. in diameter with fifteen turns of bare 2,000,000



HOME-MADE REACTANCE COIL FOR USE WITH ELECTRIC FURNACE

circ.-mil cable. The arrangement of the coil, which was merely temporary, was such as to permit varying the number of turns. This was necessary to obtain the most suitable operating conditions while securing the necessary amount of protection to the coils of the transformers and yet not reduce the input to the furnace below the amount needed, or about 550 kw. at a power factor of 55 per cent.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

THE HELICAL TUNGSTEN FILAMENT

Temperature and Blackening Effects in the Helical Filament of the Nitrogen-Filled Tungsten Lamp

THE helical construction of the filament in the nitrogen-filled tungsten lamp has brought with it various interesting novel problems. One of them is discussed by B. E. Shackelford, of the Nela Research Laboratory, in the *Physical Review* of November, 1916.

It has frequently been noticed by those working with helical tungsten filaments that the inside of the helix is very much brighter than the outside. A photograph of the projected image of such a filament, that of a commercial type C Mazda lamp, is shown in Fig. 1. It will be noticed that the inside sections, sloping downward

FIG. 1—COMMERCIAL FILAMENT

toward the right, are much brighter than the outside sections, sloping downward toward the left. The edge of the outside also displays a greatly increased brightness and the very center of the inside of the turns is noticeably darker than the rest of the inside. Some few bright streaks appear on the surface but these are due to scratches.

Pyrometer measurements on the outside and on the brightest portions of the inside of the same turns of such filaments show the brightness of the latter to be in some cases more than twice that of the former.

The object of the author's research was to determine the causes of the observed difference. Two possible explanations have been suggested: the interior may be at

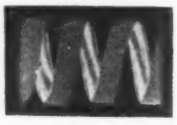


FIG. 2—SPECIAL POLISHED FILAMENT

a temperature sufficiently higher than the exterior, or the increased brightness may be due to the radiation added by reflections within the helix. The two are not mutually exclusive. The only previously published work on the subject is that of Dr. Coblentz in the ELECTRICAL WORLD, Vol. 64, page 1048, 1914.

Coblentz, using a "microscope" pyrometer, found the appearance of the edges changing so markedly with focus that he doubted whether the inside were really much brighter. He found "that some parts of the inner surface of the turn had a higher apparent temperature than the outside surface of a turn of the spiral." From these observations and from others made with a spectrobolometer he concluded that "the light coming from within the helix was not appreciably modified or blackened."

Matching the pyrometer filament first against the outside and then against the inside of the helix he found that the same increase of potential difference across the pyrometer lamp was necessary for a match through both red and blue filters. From this he concluded that the increase in brightness was the same as that due solely to increased temperature. The outside matches for red and blue corresponded, however, to different potential differences across the pyrometer lamp, and equal increments of these at different original temperatures do not correspond to equal temperature increments. This is a well-known fact and easily observable experimentally. Coblentz adds, however, "that the phenomenon is to be considered due in part to black body radiation from the interior, and so arrives at no very definite conclusion as to the relative magnitude of the effects of the two causes of brightness difference." The present author therefore undertook a systematic investigation of the question.

His measurements confirm that the interior of the helical tungsten filament has a maximum brightness of the order of twice that of the exterior. It is shown, however, that it is very unlikely that this is due to a higher temperature of the interior. If the whole of the brightness difference was due to temperature, the temperature difference between inside and outside would have to be of the order of 200 deg. This is out of the question for theoretical reasons. Further for all lamps tested, the outside-inside brightness ratio is greater for the blue than for the red, *i.e.*, the radiation from the interior of the helix is relatively stronger in the red. If tungsten radiated as a gray body, *i.e.*, if the ordinates of the energy distribution curve bore a constant fractional ratio to those of the energy distribution curve for a black body at the same temperature, this result would mean that the inside is actually cooler, for the curve is shifted toward the long wave lengths. As this is contrary to fact, tungsten must radiate more strongly, proportionally, in the blue than in the red, as has been observed previously, and the radiation from the inside must be blackened by repeated reflections. Due to a higher temperature inside of the spiral the distribution should show a shift toward the short wavelengths and as the opposite is found to be the case, at least the greater part of the increased brightness must be due to reflections rather than to a temperature difference. This conclusion was confirmed by the following experiment.

A piece of 0.5-mm. tungsten wire was flattened to about half its original thickness, after which it was polished, coiled with a pitch equal approximately to twice the width of the ribbon and mounted as a lamp. The characteristics of this filament are in general the same as those of the commercial ones, the differences being those of degree, Fig. 2. The middle dark portion of the inside is much broader and more pronounced, as are also the two adjacent bright portions. In addition to these there may be seen on the rounded edges other light and dark bands. This photograph alone is almost conclusive evidence that the phenomenon is one of reflection. The central sections of the turns appear dark since they are viewed normally and there is no opportunity for light to be added by specular reflection. Despite the fact that the surface is not an optical one there is very little diffuse reflection, as evidenced by the fact that the brightness of this part is only slightly

greater than that of the outside. The two central bright bands are seen to be images of the adjacent filaments, which fact accounts for the added brightness. The other bright bands are the images of the next succeeding turns of the helix, and the dark bands correspond to the spaces between the turns.

Quantitative support of these conclusions was obtained from measurements made at 2000 deg. K. For this lamp also the maximum brightness of the inside was found to be of the order of twice that of the outside. The broad dark bands in the center of the interior, however, showed a brightness only slightly greater than that of the exterior.

The temperature difference between the inside and the outside of an unusually heavy filament operated at 2000 deg. K., is not greater than 5 deg., as the maximum difference allowable from resistance and pyrometer measurements. For all ordinary lamps the calculated difference is of the order of 1 deg.

Another result obtained in this investigation is that tungsten radiates selectively in the visible portion of the spectrum in such a way as to make the amount of radiation, relative to that of a black body, greater in the blue than in the red.

Generators, Motors and Transformers

Air-Gap Field of the Polyphase Induction Motor.—E. A. BIEDERMANN.—A comment on Chapman's recent paper on the subject, one of the objects of which was to show that the only medium of action and reaction between stator and rotor, which need be considered in practice, was the fundamental field. The present writer shows how the same result may be obtained from his own theory and compares his formulas with those of Chapman. He confirms Chapman's general conclusion that the mutual inductive effects of the multiple fields are negligible. Though negligible for all practical purposes, they are, however, appreciable. One interesting result of Chapman's calculations is the very appreciable reduction of the air-gap dispersion to be expected with a squirrel-cage rotor, even when the number of slots is not increased.—London *Electrician,* Oct. 20, 1916.—A brief reply by Chapman is published in London *Electrician,* Oct. 27, 1916.

Generation, Transmission and Distribution

Efficiency in the Boiler House.—In an editorial on this subject reference is made to the practice in the 100,000-kw. boiler house of the Edison Company in the L Street station in Boston as discussed in the April 8, 1916, issue of ELECTRICAL WORLD. It is thought to be a little surprising that in this station use is made of boiler compound. Engineers in England have long since come to the conclusion that a boiler should not be converted into a water softener, and that water treatment should be carried out in a completely separate plant. Sampling of fuel is very important as well as the examination of the flue gases. Among the many problems with which the engineer is faced is the provision of sufficient boilers for peak load, and the banking of these boilers when no longer required. During times of peak some forcing of the boilers naturally takes place. It is questionable, however, whether anything is to be gained by the banking of boilers once the peak has passed. The efficiency of a boiler falls off rapidly if forcing is carried beyond a certain point, and the best results can only be obtained if the velocity of the gases is sufficiently low for the greater part of the heat to be taken from them by the boiler and economizer combined. On this account it is probably a better proposition to keep the full number of boilers in service during the times of light load rather than to bank a certain number, unless the difference between the peak load and the night load is very marked. It must also be remembered that the rate at which the fuel passes through the furnace depends upon the amount of steam required. Anything like complete combustion cannot be obtained if the speed is above a certain value. "This point was brought out recently at the meeting of the (British) Incorporated Municipal Electrical Association, when S. E. Fedden stated that the ash at Sheffield had been found to have a calorific value of 4648 B.t.u. and that this had been reduced to 3152 by careful supervision. If we start with coal of, say, 12,000 B.t.u. we, as engineers, cannot be proud of our methods of combustion if they leave more than 3000 B.t.u. in the ash, or in excess of 25 per cent, and we are forced to the conclusion that the best results can only be obtained by most careful supervision and by the most detailed investigation of all the losses in the boiler house."—London *Electrician,* Oct. 20, 1916.

Electrophysics and Magnetism

Corbino Effect in Various Conductors.—KEITH K. SMITH.—If a circular metallic disk in which a radial current of electricity is flowing is brought into a magnetic field the paths of the electrical carriers are, in general, changed. Corbino first made such experiments upon a disk of bismuth, and found that a magnetic field normal to the plane of the disk produces in it a steady circular current of electricity, which reverses its direction on reversal of either the radial current or the magnetic field. He also observed that if the disk is suspended so that the lines of force are oblique to its plane an electromagnetic torque tends to turn it about a vertical axis. The disk turns in the opposite direction when the radial current is reversed, but a reversal of the magnetic field does not change the sense of rotation. In the latter respect this torque differs from the electromagnetic forces of amperes, which depend upon the sense of the magnetic field. The present author's investigation had the object to measure the electromagnetic torque acting on disks of various metals and to compare the results with measurements by other authors of the circular currents produced. One of the interesting results obtained is that there is a distinct relation between the Hall effect and the Corbino effect, so that the sign and order of magnitude of one effect can be predicted if the other is known.—*Phys. Review,* October, 1916.

Wave-Forces of Magnetizing Current and Flux-Density for a "Stalloy" Magnetic Circuit.—B. HAGUE and S. NEVILLE.—Hysteresis loops are plotted for unannealed stalloy (the trade name for an iron-silicon alloy) for various values of maximum flux density, and from these are deduced (1) waves of magnetizing force required for sine waves of flux density, (2) waves of flux density produced by sine waves of magnetizing force. These are subjected to harmonic analysis, the magnitudes of the harmonics being plotted as functions of the maximum density in the first case and of the maximum magnetizing force in the second case. The amplitudes of all the components increase with increasing values of the maximum flux density, at first slowly, and afterwards very rapidly. The relative values of the harmonics compared with the fundamental at the same time gradually increase, accounting for the increasing deviation of the wave of magnetizing force from a sine shape.—London *Electrician,* Oct. 13, 1916.

Demagnetization of Iron and Steel Rods by Strain and Impact.—GUY G. BECKNELL.—An account of an experimental investigation of the redistribution of magnetic flux through the various cross-sections of magnetized rods after they have been subjected to torsion, flexure, or to the impact of a hammer. The final distribution of

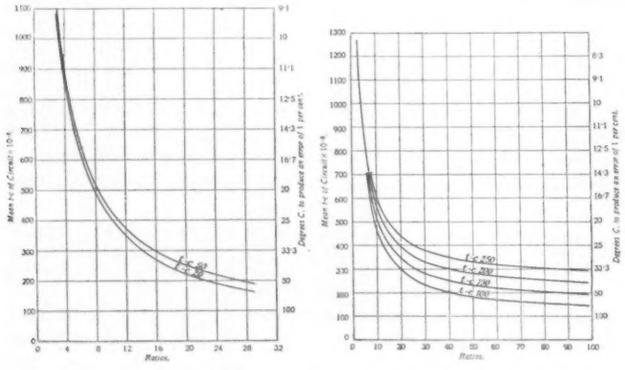
magnetic flux in a magnet under strain depends essentially on the initial flux and the curvature at each point. —*Phys. Rev.*, December, 1916.

Electrochemistry and Batteries

Separation of Neon from the Atmosphere.—A process for separating neon from other similar gases derived from the atmosphere, particularly helium, has been patented by George Claude. The production of liquid air on a large scale has made possible the generation of nitrogen, argon, helium and neon in commercial quantities, but the separation of the three latter constituents is more troublesome. The process of Claude makes use of a sealed tube, in which large carbon electrodes are inserted. This is filled with the gases to be treated and an electric discharge is passed through the mixture, when the foreign gases are absorbed, leaving nearly pure neon. The minimum surface area of the electrodes is given as 1.5 sq. dcm. per ampere. A comparatively large area is desirable, as neon is absorbed very much more slowly than the other gases. Neon is extremely permeable to electric discharges, and has found application in the tubes used as detectors of Hertzian waves. It has also been employed by Claude in the form of luminous tubes for lighting purposes.—London *Electrician*, Oct. 6, 1916.

Units, Measurements and Instruments

Temperature Coefficients of Voltmeter.—J. Rennie. —In voltmeters, the changes in their indicators, due to temperature, depend very largely on the temperature changes in the resistance of the working coil, and in any additional resistance (the "added resistance"). Economy calls for limits to the current in the working coil, hence the added resistance. This usually consists of an alloy, having a small (compared with copper) temperature coefficient, and such high specific resistivity as is consistent with cost. The resistance in the circuit of



FIGS. 3 AND 4—EFFECT OF RATIO OF ALLOY RESISTANCE TO COPPER RESISTANCE ON VOLTMETER ACCURACY

the voltmeter is, therefore, composed of a small part of copper, and a relatively larger part of alloy. The greater the resistance of the alloy portion in comparison with that of the copper the more nearly is obtained comparative immunity from errors in the voltmeter due to temperature changes. To ascertain how this progress toward immunity might be obtained by changes in the ratio between the resistances of the copper and of the alloy, and by the use of alloys of different temperature coefficients, the author has calculated a very full table given in the original article together with diagrams reproduced in Figs. 3 and 4. The ordinates (on the left hand of the scale) give the mean temperature coefficient of the total circuit $\times 10^{-6}$ per degree C. for the alloy selected. The abscissas are the ratios of the resistance of the alloy part of the circuit to the copper part of the circuit. The temperature coefficient for copper is taken as 0.00428 per deg. C. The different curves in the diagrams refer to different alloys used; for instance, the curve marked *t-c* 20 refers to an alloy with a temperature coefficient of 20×10^{-6} per degree C. As already stated the scale of ordinates on the left gives the temperature coefficient of the total circuit and since this is the quality which determines the magnitude of the change produced upon the circuit by any change of temperature, the author indicates in the ordinate scale on the right the number of degrees C. rise of temperature which would correspond to a particular height of ordinate. For example, if the circuit of a particular voltmeter were composed of copper in a ratio of 1 to 10 (abscissa 10) with an alloy with a temperature coefficient of 150×10^{-6} per degree C. (curve *t-c* 150), Fig. 4 shows that such a voltmeter should be subject to a rise of about 19 deg. C. (right-hand ordinate scale of Fig. 4) before the indications are affected to the extent of 1 per cent. For convenience the curves are in two separate groups; Fig. 3 for the ratios 1 to 32, and Fig. 4 for the ratios 1 to 100. In the first group (Fig. 3) it was considered sufficient to draw curves for *t-c* 20 and *t-c* 50. In the second group (Fig. 4) the four curves are shown separately down to ratios of about 1 to 7; for ratios lower than 1 to 7 a mean curve is shown.—London *Electrician*, Oct. 27, 1916.

Telegraphy, Telephony and Signals

Unbroken Alternating-Current for Cable Telegraphy. —Louis Cohen.—The author discusses the proposed system of G. O. Squier abstracted at length some time ago in the *Digest*, the principal feature being the use of alternating current for cable telegraphy. The present author points out that the efficiency of transmission will be increased if the receiving apparatus is designed for complete absorption to avoid reflections and eliminate the losses caused by it. The author works out this problem and shows that the condition which must be fulfilled is that the receiving apparatus must have a certain capacity and resistance in series, formulas for which are given in the article. As the frequency is increased the resistance and capacity required are diminished.—London *Electrician*, Oct. 20, 1916.

Wireless Telegraph Installation for Small Ships.— An illustrated description of a one-quarter kilowatt wireless telegraph installation of the Marconi system for vessels of small tonnage. The installation is capable of adjustment for the transmission of any wave-length between 300 m. and 600 m., and the whole of the transmitting apparatus, including the motor-alternator, is mounted compactly in a cabinet approximately 27 in. high, 26 in. wide and 17 in. deep when closed.—London *Electrician*, Oct. 20, 1916.

Telephone Exchange.—F. K. Singer.—A long and fully illustrated description of the Grant Telephone Exchange in Pittsburgh, which is a typical central office installation of the most modern metropolitan type.— *Elec. Jour.*, November, 1916.

Miscellaneous

United States.—M. K. Sosnowski.—The author gives notes on a trip through the United States, with special reference to the central stations in New York, Chicago, Philadelphia, and Detroit. The progress made by central stations in general during the last fifteen years is outlined. Pumping stations are next considered. Notes on steam plant, high voltage transmission systems, electric traction on railways, telephony, and the organization of the Ford company in Detroit are also given.— *Memoires de le Societe des Ingen. Civils, de France*, April-June, 1916.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

C. E. Howell, formerly chief assistant mechanical and electrical engineer, Pacific Light & Power Corporation, Los Angeles, Cal., has resigned to accept a position with the Electric Bond & Share Company, New York.

Raymond H. Smith, who has been appointed to succeed Edward Hammett as vice-president and general manager of the Sheboygan (Wis.) Electric Company, has been manager of the Jackson (Miss.) Light & Traction Company.

Emile Hemming, formerly vice-president of the Hemming Manufacturing Company of Garfield, N. J., has been appointed president of the American Insulator Company of New Freedom, Pa. Mr. Hemming is well known in the electrical field, having brought with him from Europe in 1908 some of the first developed heat-resisting organic insulating products in molded form. Mr. Hemming is also the author of a treatise on molded insulating materials and plastic compositions used in the electrical arts, giving a practical outline and classification of the different substances.

Day Baker, who for many years was connected with the General Vehicle Company as New England manager and later as manager of foreign and domestic agencies, has left that organization and is returning to Boston, where he will enter the motor-vehicle business for himself, becoming New England distributer for the new long-distance Atlantic Electric vehicle and a gasoline truck. The New England Section of the National Electric Light Association recently appointed Mr. Baker chairman of its electric vehicle committee, and the gasoline-truck dealers of Boston have made him treasurer of their association.

B. A. Brennan, formerly contract manager of the Westinghouse Machine Company and later sales manager of the power department of the Bethlehem Steel Company, has resigned the vice-presidency of the Mercantile Trust Company of St. Louis, Mo., to accept the presidency of The Citizens Company, Inc., of Baltimore, Md., an investment banking institution, which finances corporations and handles securities.

R. J. Cory has succeeded L. O. Gordon as manager of the Valparaiso Lighting Company of Valparaiso, Ind. Mr. Cory has been superintendent of the Valparaiso Lighting Company for the last three years, coming from De Kalb, Ill., where he first entered the electrical business in 1907. Mr. Gordon was recently appointed manager of the Jackson (Miss.) Light & Traction Company.

Francis A. Vaughn and **Hans J. Meyer** of the firm of Vaughn & Meyer, consulting engineers, Milwaukee, Wis., have joined in partnership with Charles L. Pillsbury, of the consulting engineering firm of Charles L. Pillsbury Company, of Minneapolis and St. Paul, Minn. Messrs. Vaughn and Meyer will continue to conduct their Milwaukee offices under the firm name of Vaughn & Meyer, and the Minneapolis and St. Paul offices will be conducted under the present firm name of the Charles L. Pillsbury Company. The headquarters of Mr. Pillsbury and Mr. Meyer will be at the Minneapolis office; those of Mr. Vaughn at Milwaukee.

OBITUARY

Charles Walter Warren, assistant to the president of the Cutler-Hammer Manufacturing Company, 122 South Michigan Avenue, Chicago, was killed by the overturning of his automobile near Butler, Ind., on Nov. 18.

John A. Barrett, well known as an electrical inventor and more recently as an engineer for the Bell Telephone interests, passed away at his home in Maplewood, N. J., on Nov. 9. Mr. Barrett was born in Woodstock, Vt., on April 30, 1858, and in 1882 entered the service of the Western Electric Company, where he assisted in the development of the Patterson cable and the chloride-of-silver battery. In 1884 he started in business in New York with his brother, forming the partnership of Barrett Brothers. He also became associated with the Okonite Company, assisting in the development of that business. Several batteries which are still in use, were fruits of Mr. Barrett's genius during this period. He was employed in 1886 by E. J. Hall to study the cross-talk problem on the New York and Philadelphia telephone line. While working out this problem, Mr. Barrett invented the transposition system, since then in general and continuous use. When in 1888 the New York and New Jersey Telephone Company began the manufacture of underground cable, Mr. Barrett became associated with the late W. D. Sargent in that work, and was the first to use paper-insulated wire and continuous-cable sheath. Mr. Barrett about this time, with F. H. Perrett, invented an electric motor, the feature of which was a "laminated field." Later he formed a manufacturing concern known as the "Elektron Company" and became its president. In 1890, he constructed one of the first storage-battery automobiles, which attracted much attention. Since 1893 Mr. Barrett had been in active service in the Bell company's engineering department, handling engineering and legal work.

J. A. BARRETT

Alfred C. Einstein, first vice-president and general manager of the Union Electric Light & Power Company, St. Louis, Mo., and one of the best-known utility executives in the United States, died suddenly at St. Louis on Nov. 19. Mr. Einstein was born at Hoboken, N. J., and received his education in the schools of St. Louis and at Washington University. On leaving the university he became general manager of a mining property in Silver City, Mexico, returning to St. Louis in 1890 to take up the duties of president of the Consolidated Engineering Company, which was engaged in the installation of gas and electric plants in various parts of the United States. Afterward he acquired an interest in the Paducah (Ky.) Electric Light & Street Railway Company, and became its president and general manager, a position he held for four years. Later he became financially interested in the Suburban Electric Light & Power Company of St. Louis and for a time managed both it and the King Electric Light & Power Company with which the Suburban was later merged. It was, however, as general manager of the Union Electric Light & Power Company of St. Louis, of which he became the executive head in 1911, that Mr. Einstein attracted wide attention by his progressive policies with respect to getting central-station business and in dealing with the company's customers and the public.

A. C. EINSTEIN

NEW APPARATUS AND APPLIANCES

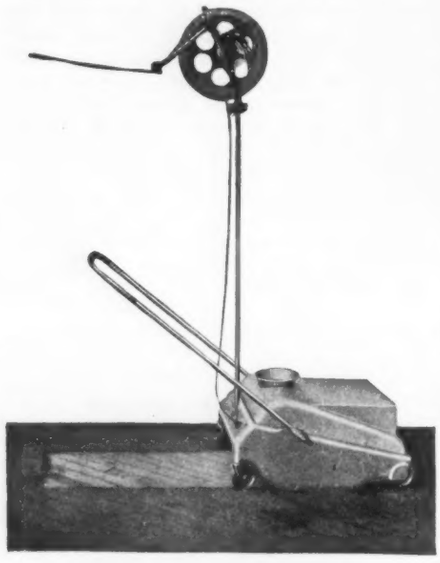
A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Impregnated Switchboard Stone

Lin-Stun, which is a natural stone, impregnated with an insulating compound to render it entirely moisture-proof and increase the insulating resistance, is now being manufactured by the Lin-Stun Company, 5010 Gloster Street, Pittsburgh, Pa. The maker states that tests have been made with 125,000 volts on pieces 1 in. thick without puncturing the stone. This material is especially adapted for switchboards, panelboards, barriers, insulated walks and such other uses as require a board to resist moisture, high voltage and large currents. It is being made in all commercial sizes and thicknesses and in several colors.

Electrically-Operated Floor-Scrubbing Machine

Wetting, sweeping, scrubbing and drying a floor in one operation are the claims by the Dale-Rey Corporation, 150 Lafayette Street, New York City, for its electrically driven floor-scrubbing machine shown in the accompanying illustration. A tank of clean water



MACHINE THAT WETS, SWEEPS, SCRUBS AND DRIES FLOORS

is carried on the machine, the amount distributed being controlled from the handle by the operator. This water is immediately swept up by a cylinder brush 20 in. in circumference and 16 in. wide, revolving at about 600 r.p.m. The brush is driven by a quarter-horsepower motor, connected by a Morse silent chain and sprocket. All dirt and water are carried by the brush over an apron into a receiving pan so that the scrubbing is always done with the clean water It is claimed that if the attendant pushes the machine forward at the rate of 1 mile an hour the machine will scrub 7000 sq. ft. of floor in an hour. The outfit is 28 in. long, 20 in. wide and 16 in. in height over all. It weighs about 100 lb. and is all metal, except the brush.

Cabinet Electric Range

Two electric ranges of the standard cabinet type, one with two cooking compartments and the other with one, have been developed by the Standard Electric Stove Company of Chicago, Ill. Each type is equipped with a

FIG. 1—RANGE WITH TWO OVEN BURNERS AND TWO HOT-PLATE BURNERS

large oven, cooking wells, hot plates, clock regulator, master switches, signal lamp and extension end shelves.

The ovens are lined throughout with heavy gage aluminum, and have two luminous, easily removable heating units 8 in. by 8.5 in. by 1 in., of 1000 watt capacity, with three heat controls. The ovens have heavy mineral wool packing and a steam vent on top. The oven temperatures are said to be, with both burners on high heat for five minutes 225 deg., for ten minutes 470 deg. and for fifteen minutes 590 deg. In the cooking compartment, the wells are constructed entirely of pure aluminum like the oven with the castings of gray iron. The removable heating element in the base is rated at 660 watts, of nichrome wire heavily insulated with rock mineral wool and made watertight in gray mica. The temperatures for various lengths of time the heating element is in operation are said to be as follows: For ten minutes 171 deg., fifteen minutes 207 deg., twenty minutes 311 deg., twenty-five minutes 369 deg., thirty minutes 426 deg., thirty-

FIG. 2—STANDARD CABINET TYPE RANGE WITH ONE COOKING COMPARTMENT

five minutes 481 deg., forty minutes 533 deg., forty-five minutes 581 deg.

The hot-plate elements are 8 in. in diameter, incased in heavy steel bowels and provided with high, medium and low switches giving 1000, 500 and 250 watts rating respectively. The element, it is declared, will boil one quart of water in eight minutes, 2 qt. in ten minutes.

The body of the stove is of Armco rust-resisting iron with a royal blue enamel finish. The extra equipment consists of one 3-qt. and one 8-qt. "Wear-ever" aluminum circular kettles, two 2.5-qt. aluminum semi-circular kettles and two oven racks.

The wiring for the range is in heavy conduit with the outlet box readily accessible for connection to two or three wire systems. All elements are wound for 110-volt service unless otherwise specified. The total demand of the one compartment stove is 4800 watts and 5320 watts for the two-compartment stove.

In Fig. 1 is shown a special range with two 800-watt luminum oven burners and two 1000-watt hot-plate burners. The oven burners are rated for high heat at 1000 watts; medium, 400 watts; low, 200 watts, and the hot-plate burners for high heat, 1000 watts; medium 550 watts; low, 250 watts. The

materials used in construction are similar to the standard cabinet type ranges. The equipment includes a broiling pan with special boiler rack, two oven racks, and a complete set of elements, switches, etc.

Semi-Indirect Holder

A semi-indirect holder which can be used where fixtures are already in place without removing the socket in order

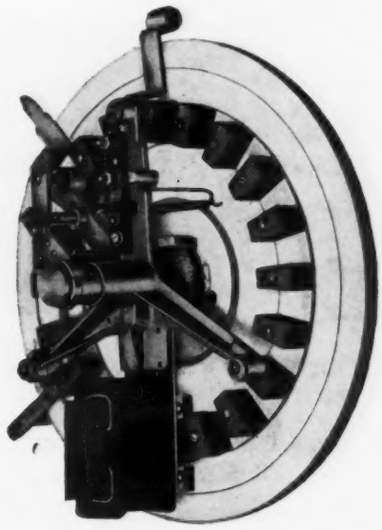
METHOD OF USING SEMI-INDIRECT HOLDER

to install the holder, is now being made by the J. H. White Manufacturing Company, 111 North Third Street, Brooklyn, N. Y. This device is designed for standard 2.25-in. glass shades and allows the shades to be used either in an upright or inverted position on pendants, portables or ceiling lights. In the illustration, the inner view shows the holder in use with an ordinary ceiling light, the outer view being that of the holder.

Electric Motor for Phonographs

An electric motor designed for operating phonographs has been developed by the Tiffany Motor Company of West New York, N. J. The power to rotate the record is applied magnetically to the turntable, which is itself made the armature of the motor. This construction permits the use of a much heavier turntable than is practicable with a spring motor, and gives the much desired flywheel effect, which insures a smooth and steady motion. The friction-brake governor has been eliminated and in its place a centrifugally operated circuit interrupter is used, which maintains a constant speed with great accuracy, irrespective of varying loads or voltages, and at the same time regulates the strength of the current flowing through the motor, so as to reduce the current consumption to the smallest quantity necessary for its operation.

From the accompanying illustration it will be seen that the spaces between the motor and governor-shafts and their respective casings are loosely packed with oil-saturated felt. This arrangement supplies oil to the bearings for a long time. Oil holes are conveniently located so that the supply may be renewed when necessary. Attention is called to the fact that all bearings are of the self-aligning type and that the turntable is supported upon ball bearings. These balls are gaged to an accuracy which does not permit of a variation greater than one ten-thousandth part of an inch. The motor shaft, which is the turntable spindle, is made of tool steel, and it, as well as its bearings, are gaged to a fraction of one one-thousandth part of an inch. It is evident that this construction means that the parts will revolve with little friction, hence a very small amount of



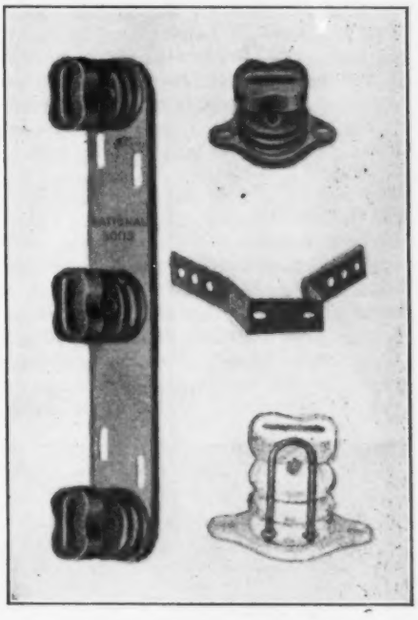
TURNTABLE OF PHONOGRAPH USED AS ARMATURE OF MOTOR

energy is required for operating the motor, averaging about one-sixth of an ampere from a battery of five cells. About 1,500 records may be played with one set of five dry cells, it is claimed, before the battery becomes exhausted. To obviate failure of the battery without due warning, six cells of the battery are supplied with the motor, only five of which are originally connected, the sixth cell being added when the five cells become exhausted to a degree which will not maintain the required speed. This added cell ordinarily gives an additional life of about 200 records, which is ample time in which to provide a fresh battery. Included with the motor is a metal motor board so arranged that the spring motor of any standard make of phonograph may be replaced with the Tiffany motor, the two motors being practically interchangeable. These motors are also supplied for operation on the customary lighting circuit, either alternating or direct current.

Wall Brackets

Wall brackets designed to reduce the cost of service connections without impairing safety or service have recently been brought out by the National Metal Molding Company, Fulton Building, Pittsburgh, Pa. Each bracket consists of a sherardized stamped steel base plate on which are mounted high-grade porcelain insulators. The insulators are secured to the base plates by means of sherardized U bolts and nuts, as shown in an accompanying phantom view. The round transverse holes, shown in the insulators, are for the purpose of securing the wires, the U bolts passing completely around these. In other words, the insulators are "iron bound," the construction being very similar to that of strain insulators. This design, it is claimed, results in a bracket having not only great tensile strength, but also a bracket which can be easily and quickly installed. Attention is called to the fact that the necessity of using tie-wires has been entirely eliminated.

The service wires which lead from the pole are threaded through the holes in the upper bracket and dead-ended, by looping, at the lower bracket. The weight of the wires, between the pole and the building, it is pointed out, always keeps taut the short vertical spans between the upper and lower brackets. Attention is also called to the fact that, by removal of the center insulator, a three-point bracket may be used in making a right-angle turn with two wires and the wires kept parallel. Insulators on the two-point brackets are on 9-in. centers and on the three-point brackets



WALL BRACKET INSULATORS FOR HOUSE SERVICES

on 6-in. centers. The design of these brackets is such that their use is practically universal, as they may be installed in either a vertical or horizontal position, or at any angle. They will also be found to be admirably adapted for supporting open feeders in industrial plants, mills and warehouses, and can readily be attached to steel girders.

Mechanical Soot Blowers

Diamond model "G" mechanical soot blower for use in water-tube boilers is the latest product of the Diamond Power Specialty Company of Detroit, Mich. It will be noted from the accompanying illustration that the system is made

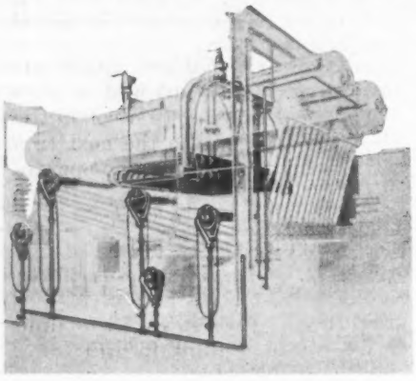


FIG. 1—SOOT BLOWING SYSTEM

up of a series of units, each unit consisting of five different elements, as follows: (1) A head through which the steam passes from the main soot blower supply line when the valve is opened. This is the foundation element to which the other elements are attached. (2) A wall box which is bricked into the setting. The box supports the unit, and is so constructed that the blower can be turned freely without admitting air to the furnace. (3) A blower element running cross-wise of the bank of tubes and consisting of a small header with nozzles so placed as to discharge steam vertically between the boiler tubes. (4) A sheave or hand wheel by means of which the blower element is rotated. (5) Bearings which support the blower element and permit it to revolve freely.

The maker calls attention to the following features of this soot blower, all of which are covered by patents. (1) The use of a new metal, a product of the General Electric laboratories, known as Insuluminum, which possesses heat-resisting properties 50 per cent greater than iron and steel. (2) The use of steam nozzles designed like a Venturi tube. With the same pressure and size of aperture, steam is discharged from these Venturi nozzles at three times the velocity possible with a straight nozzle.

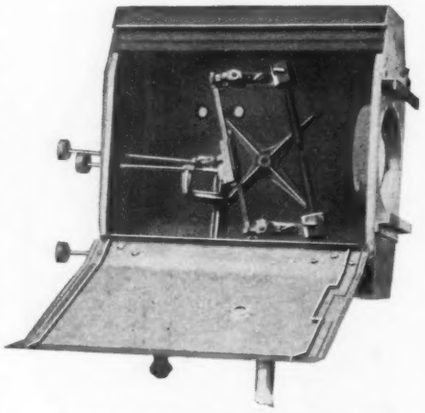
FIG. 2—SOOT BLOWER UNIT

(3) The use of a goose-neck of special design, and air-inlet valves which prevent furnace gases being drawn into the blower element when steam is shut off, and a partial vacuum created.

As a means for increasing the economy of plain operation, interesting claims are made. The system is guaranteed to effect a saving of 4 to 11 per cent in fuel; an increase in boiler efficiency of 4 to 11 per cent; a saving in labor of many hours per day; an increase in length of service of boiler flues through prevention of corrosion; and a saving of 25 to 75 per cent of steam used for cleaning.

Spot Lamp for Flood Lighting

The Brenkert Light Projection Company of Detroit, Mich., has announced the development of a spot lamp constructed so that the maximum spot and flood illumination can be obtained by the simplest means of operation. The standard equipment of this outfit con-



ALTERNATING OR DIRECT-CURRENT SPOT LAMP

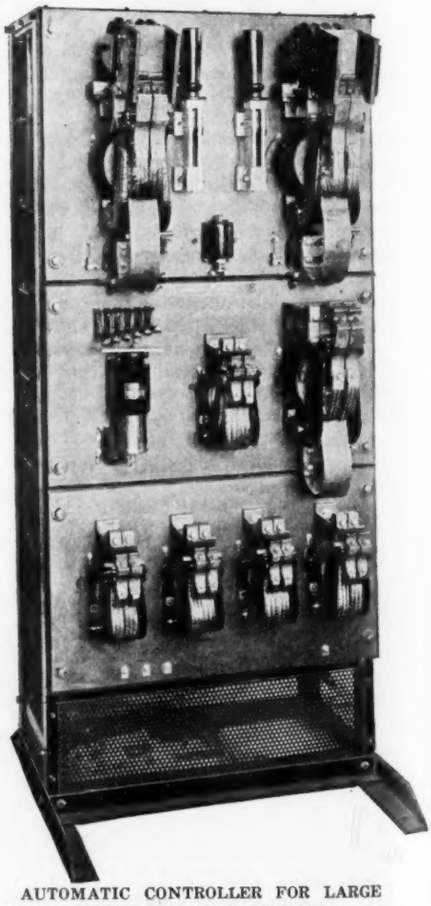
sists of a spot lamp complete with either direct current or alternating current arc lamp, 110 volt rheostat, 30 amp. switch in box, three color slides, and a 6-in. spot lamp lens.

The arc lamp is made in two types. The direct-current type is constructed so that the upper feed, as the carbons are consumed, maintains a constant central position of the arc. With the alternating-current type the feeds work alike, as the carbons are consumed without any noticeable difference, a centering device taking care of any variations in the operation. Where alternating current is used with the standard equipment, satisfactory results, it is claimed, can be obtained as far as 80 ft. For distances greater than 80 ft. with alternating current the makers recommend the use of an extension front with long range lens.

All parts of the arc lamp are made extra heavy and the current carrying metals are of high-grade bronze. A combination metal cushion and stop in the carbon jaw provide a positive grip on each carbon and the centering device keeps the arc in line with the optical axis of the lens.

Large Automatic Controller

The controller shown here is a recent development of the Industrial Controller Company of Milwaukee, Wis., intended for use with large direct-current motors. This controller is quite interesting in its operation as it combines both current limit and time limit acceleration, thereby not only securing protection to the motor by means of the current-limit acceleration, but preventing too rapid acceleration of the motor under light loads. The controller consists of a number of large magnetic contactors, the first of which is equipped with a powerful blowout and arcing shields. The acceleration is accomplished by means of a master solenoid at the left of the panel, which when closing energizes the coil of the large magnetic contactors successively, thereby closing the switches and bringing the motor up to speed. The acceleration of the master solenoid is retarded by means of an air dash pot, and in addition by a braking magnet, which in turn is controlled by a current limit relay at the center of the panel. When the current in the motor exceeds a predetermined amount, the master solenoid is prevented from operating until the current is reduced to the amount for which it is set. On the controller illustrated, magnetic switches with blowouts are provided for both sides of the line and each are equipped with overload relays thus giving overload protection to the motor. These controllers are adapted for use with large steel mill rolls and similar machinery.



AUTOMATIC CONTROLLER FOR LARGE DIRECT-CURRENT MOTORS

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

SUMMER COMMERCIAL WORK FOR ENGINEERING STUDENTS

Society of Electrical Development at Regular Meeting of the Board of Directors Appoints Committee to Work Out Plans

The regular meeting of the board of directors of the Society for Electrical Development was held in the offices of the society in New York City, on Nov. 15.

James M. Wakeman, general manager of the society, read his report outlining the work carried on by the society since the previous meeting of the board. The report dwelt particularly upon the electric range campaign, the poster competition, and special service rendered to members of the society, consisting of the preparation of advertising copy, special window displays, the writing of special letters, the imparting of information upon the applications of electricity for power purposes in the various industries, data on rates and ordinances, etc. The report outlined the highway lighting campaign, the work which has been done in connection with America's Electrical Week, and referred to the prominent part taken by the society in working up national interest in the flood-lighting of the Statue of Liberty.

The treasurer's report was read, discussed and placed on file, after which H. W. Alexander was invited in and explained to the meeting in detail America's Electrical Week publicity and other campaign work, which he illustrated by exhibiting the special issues of the popular magazines and trade papers, booklets, folders and other material prepared in connection with the campaign.

James H. McGraw expressed the opinion that the America's Electrical Week activities of the society constituted the greatest advertising work ever done. He said that the society got ideas to the ultimate consumer as no other advertising ever had, and that the society's work typifies the greatest good to the greatest number.

Inasmuch as it is customary to have the Jupiter of the Jovian Order serve upon the board of directors, and that the new Jupiter, Henry L. Doherty, is already upon the board, representing the central station interests, a motion was made and carried that Ell C. Bennett, Mercury of the Jovian Order, be invited to sit upon the board during Mr. Doherty's term as Jupiter.

The general manager read a letter asking that the society for Electrical Development guarantee a sum not to exceed $5,000 to be used for the purpose of installing a plant at Bedloe's Island to flood-light the Statue of Liberty in case the present arrangement with the Public Service Electric Company prove unsatisfactory at the end of the year. The federal government demands that a guarantee of this character be given. After some discussion, the officers of the society were authorized to guarantee $5,000.

It was decided that another housewiring campaign should be conducted during the coming spring to be known as "House Wiring Season" to run from April 1 to May 15.

A letter from Prof. George D. Shepardson of Minneapolis was read, on the subject of having engineering students sell electrical devices during their vacation season. A committee was appointed to work out plans to interest engineering students in this subject, and it was suggested that the committee ask to be allowed to sit in with the National Electric Light Association committee on relations with educational institutions the next time it meets, so that the two organizations may co-operate.

COMMISSION ACQUIESCES IN NEW YORK RATE REDUCTIONS

After Further Consideration It Overrules Objections to a Settlement Without Valuation and Upholds Company Plan

The New York Public Service Commission, First District, announced on Nov. 16 that it acquiesced in the reduction in the maximum rate of the New York Edison Company which was proposed at a hearing before it on Nov. 2. It adjourned hearings in the case until Jan. 4, 1917, when, if the first agreed reduction is made, the hearing will be adjourned to June 4. At the latter date the commission will consider the proposed second reduction. As stated in the ELECTRICAL WORLD for Nov. 11, 1916, the proposal of the company is to reduce the present maximum rate of 8 cents per kilowatt hour to 7.5 cents, exclusive of lamps, beginning Jan. 1, 1917; and, if no unforeseen adverse conditions develop, to make a further reduction to 7 cents, exclusive of lamps, beginning on July 1, 1917. Chairman Straus announced that it was in the minds of himself and the commissioners to accept the reductions proposed by the company. Frank R. Greene, representing the Electrical League of Greater New York, which is composed of consumers of the Edison company, objected to the acceptance of the proposed reductions. He held that the conditions surrounding these reductions would tie the hands of the commission for several months and prevent an appraisal. He expressed the belief that an appraisal would result in rates considerably lower. He declared that the attitude of the company appeared to be a willingness to purchase a postponement of appraisal by a reduction in rates.

Chairman Straus and other members of the commission objected to the remarks of Mr. Greene. Mr. Straus said that they were decidedly unfair and unjust to the commission and the public. The consumers, he added, are obtaining a very material benefit and the commission had very carefully considered the whole situation. He pointed out that fully 95 per cent of the consumers in Manhattan and the Bronx would benefit from the reductions.

Chairman Straus then asked J. W. Lieb, vice-president of the company, to state what saving would accrue to consumers from the reductions. Mr. Lieb replied that the first reduction would save $750,000 for New York Edison Company consumers and the second a like amount, making $1,500,000 in a year. The two reductions would also save $250,000 in the year for consumers of the United Electric Light & Power Company.

Benjamin C. Marsh, representing the League for Municipal Ownership and Operation, declared that the commission should force the companies to give still

further reductions. He quoted rates in other cities, but Commissioner Hayward said that these were no criterion to govern action in New York.

Chairman Straus and the other commissioners pointed out that legal restrictions govern the commission, preventing any summary action by it such as Mr. Marsh proposed.

CLEVELAND MUNICIPAL STATION SHOWS LOSS

Report of Accountants Indicates a Deficit of More Than $58,000 for 1915 and Bad Bookkeeping as Well

Nau, Rusk & Sweringen, accountants, made their report of the audit of the Cleveland (Ohio) municipal light plant accounts on Nov. 17. It shows that there was a deficit for 1915 of $58,219.44, instead of the profit that has been discussed from time to time. The receipts for the year were $548,574.72, while the operating expenses amounted to $428,669.74, leaving the gross income $119,-904.98.

From this the report shows the following deductions: Interest on a debt, $112,655.90; other interest, $9,545.48; interest on city investment, $24,229.32, and taxes foregone, $31,693.72 making a total of $178,124.42. This exceeds the gross income by $58,219.44. It was shown that the project could not have been financed at an interest rate of 4.5 per cent if the entire credit of the city had not been behind it, and if it had been compelled to pay the same interest rate as private companies the loss would have been $204,650.14.

The accountants evidently believed that business principles demand the same charges against a municipal plant as against a private company, in order that there may be little possibility of throttling competition. For this reason the plant was charged with taxes under the head of "foregone taxes." The item of interest on city investment refers to the dead loss of $538,429 on the old South Brooklyn and Collinwood plants. The accountants believe that such losses as these should not be consigned to oblivion, but should be considered just as they would have to be in a private corporation.

Methods of bookkeeping were severely criticised and many pages of the report were devoted to corrections, so that the plant may start right again.

Public Service Commission News

Wisconsin Commission

In authorizing the city of Park Ridge to increase its rates, the Public Service Commission held that it was proper to charge more for gas furnished through prepayment gas meters than for gas furnished without the use of such meters since the cost of rendering service through the prepayment meter was greater than similar service through the standard credit meter, owing to higher meter investment, higher installation cost, higher maintenance cost, higher reading and accounting cost, and the losses due to petty thievery.

The Wisconsin Supreme Court has affirmed the constitutionality of the water-power law conferring on the Railroad Commission authority to issue orders fixing the level of water in dams in the state.

The question arose in the case of the Chippewa & Flambeau Improvement Company against the Railroad Commission. The company purchased the so-called Henry Dam at the outlet of Rest Lake at the head of Manitowish River in Chippewa County, and maintained the dam so that the maximum head of water was 15 ft. On the complaint of owners of property near the lake the commission issued an order providing that the maximum head of water should not, at any time, exceed 8.5 ft. The company brought suit to have the order declared invalid. The Circuit Court upheld the commission and the Supreme Court affirmed that decision.

Maine Commission

The application of the Wiscasset Water Company for approval of its contract with the town of Wiscasset has been disapproved by the Public Utilities Commission, because in the opinion of the commission the granting of free service to the town imposed an extra burden on its other subscribers and was unlawful, against public policy, and wrong in principle, in that the town and the company are not the only interested parties, but that each customer is interested and has a right to insist that the company and the town shall not be permitted to enter into a contract to disobey the law.

California Commission

The Railroad Commission has consolidated the three actions brought by the city of Redding against the Northern California Power Company, Consolidated, bringing into question the rates for electricity, gas and water, an action on the commission's own initiative to establish a valuation of all the properties of the company and an application of the company that the commission fix and determine just and reasonable rates, rules and regulations for all classes of service throughout its entire system.

The commission held that the failure of a utility to earn an expected profit does not necessarily establish that utility's right to a later increased earning based on a valuation which includes the profits which it has been unable to earn. Allowance for developing business must be measured by the reasonableness of the expenditure and although an accrued deficit may in a measure indicate such cost, it cannot be accepted as conclusive either that the actual expenditure was reasonable or that the expenditures made added value to the plant.

The company, it was pointed out, is still in a developmental stage, and an attempt at this time to reimburse it for deficits incurred under a rate which might at present appear to be reasonable would result in a rate higher than the service is reasonably worth.

Lands purchased to secure water rights, though at present not used for any purpose in connection with the utility business, were considered as non-operative property and the value thereof, in excess of the value of the water itself, was not allowed. The company, it was shown, has facilities capable of a production of 16,150 kw. in excess of its peak demand. Of this amount, 11,-150 kw., representing an investment of $1,336,773.50, was considered to be non-operative at the present time and therefore excluded from the valuation upon which rates are based.

In establishing the return to which the company is entitled, in connection with its electrical business, the cost of money was figured at 6.5 per cent and a return of 8 per cent was allowed upon its investment used and useful in its electrical business.

The property being still in a developmental stage, full rates for certain services were not permitted at the present time. Various schedules of rates were established for the different classes of consumers and recommendation was made that the company meter its consumers and also familiarize them with the various schedules of rates provided, so that they can take advantage of the particular schedule best suited to their needs.

Electric Sign as Danger Signal.—An electrically illuminated sign is to be placed by the United States Government on the up-side of the Big Four bridge across the Ohio River at Louisville to warn inexperienced voyagers of the dangerous falls about a mile below.

New Zealand May Use Electric Smelting on Large Scale.—It is now proposed to produce pig iron on a large scale in New Zealand by means of electric furnaces. Undeveloped water power is abundant and may be developed easily and at an exceedingly low figure, it is maintained.

Kentucky University Engineering Schools to Consolidate.—Three of the engineering schools of the University of Kentucky at Lexington, the College of Electrical Engineering, College of Civil Engineering and the College of Mines and Metallurgy, it is given out by President Barker, are to be consolidated.

Maintenance Cost of Luminous Arcs.—Figures compiled covering the cost during the past year of maintaining 343 luminous arc lamps in Tacoma, Wash., show the annual costs to be as follows: Depreciation, $4.90; electrodes, $4.55; glass and parts, $2.35; labor, $6.65, and overhead, $0.70; a total of $19.15 per lamp per year.

Chippawa-Niagara Falls Power Development.—Sir Adam Beck, chairman of the Ontario Hydroelectric Power Commission, announced on Nov. 9 that the right of way for the canal to be constructed between Lake Erie and the Niagara gorge, to create a new fall at which power will be generated by the commission, has been acquired, and that work will be undertaken as early as possible next spring. Contracts will be let during the winter.

Free Power to Encourage Manufacturing Concerns to Locate in City.—Free power for a term of years is being considered as an industry-getting proposition by the City Council of Owensboro, Ky. To this, according to the recommendation of Mayor Hickman, free water for the same term of years would be added, the city owning both water and power plants. For some time the city has had a standing offer of power on a 1-cent-a-kilowatt-hour basis to encourage location of new manufacturing enterprises in that city.

New Jersey Utility Tax, 1916.—A total tax assessment of $1,535,554.02 for 1916 for utility properties in New Jersey has been announced by the State Board of Taxes and Assessment, an increase of $29,777.06 over 1915. The assessment covers 317 public utility corporations and four individuals, as follows: Thirty-one street railways, $797,088.71; 115 electric light and gas, $490,127.18; forty-one telephone and telegraph, $159,795.58; 114 water, $80,846.66; seventeen sewer and pipe line, $6,134.40; three district telegraph messenger, $1,561.49. The fund will be divided among the municipalities of the twenty-one counties in accord with local gross receipts, being 5 per cent for railways and 2 per cent for the remaining utilities.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

"Electricity" In Place.—This week the 16-ton statue "Electricity" was set in place on top of the new Telephone and Telegraph Building, New York City.

"ELECTRICITY"

The statue, an illustration of which is shown below, was modeled by Miss Evelyn Beatrice Longman of New York. It stands 24 ft. high, and looks out over the city from its pedestal 434 ft. above the street.

Government Ownership in Canada Hits Municipal Treasuries.—The taking over of the electric power interests in Ontario, Canada, by the government has brought out protest in reference to the loss of taxation by various municipalities. A deputation recently waited on Premier Hearst, urging that, as the loss to the municipalities would be in the neighborhood of $45,000 a year, the government pay the taxes for the parts of 1916 and 1917, they have had the plant, and arrange suitable compensation for the succeeding year. Sir Adam Beck has suggested that payment of a portion of the taxes be made out of the earnings of the Ontario Hydro-Electric Commission, though the payment might have to be spread over a considerable time. Premier Hearst has the matter under consideration and has promised to submit a proposition in the near future.

No Tacoma Municipal Power for Seattle.—It has become known that the city of Seattle has made an effort to purchase a block of 5000 kw. of power from the Tacoma municipal plant. While Seattle was willing to build the necessary transmission line the Tacoma commission is opposed to the plan because of the growing sale of power locally.

Toledo Bank to Be Crowned with Ball of Electric Light.—The Second National Bank building, Toledo, Ohio, twenty-two stories high and towering nearly 500 ft. in the air, has ordered a huge revolving ball of light to crown its topmost height. The building is the tallest in Toledo, and the ball will be erected 30 ft. above the top of the building, which will make it the highest point in Toledo. The steamboat captains on Lake Erie will be able to see the ball above all other city lights; passengers on incoming trains will see the beacon flashing. It will measure 12 ft. in diameter and contain 700 75-watt incandescent lamps.

Heating Molasses by Electricity.—The Arkansas Valley Railway, Light & Power Company, Pueblo, Colo., has called attention to a new use for electricity employed in the Arkansas Valley by farmers and stockmen. Manager Raber says: "A number of stockmen feeding mixed feed to stock have had trouble in winter with molasses freezing, and, after thawing same out, being able to maintain one temperature so as to keep the molasses flowing. We overcame this through the use of three 3600-watt immersion heaters installed in metal vats. Two vats were constructed, one 5 ft. by 5 ft. by 5 ft., another 4 ft. by 4 ft. by 5 ft., the smaller vat being placed in the larger vat. The smaller one contained the molasses and the larger one was filled with water containing the heaters. To thaw the molasses out, all three heaters are put in use; to maintain one temperature one heater is used."

Turbine Driven Isolated Plant Replaced by Central Station Service.—The Griffin Wheel Company, a Chicago concern with three factories, has just contracted for service from the lines of the Commonwealth Edison Company for the last of these three buildings. This large industrial plant has been supplied with power from an isolated plant, which was only eight years old. It contained two 500-kw. turbo-generators, which were operated condensing. The boiler room equipment included water-tube boilers and chain-grate stokers. The condensing water was cooled in a cooling tower. The connected load in the factory amounted to about 2000 hp., practically all of which was handled on a 440-volt, three-phase, distribution system. George H. Jones, power engineer for the Commonwealth Edison Company, said that the satisfactory electric service which had been rendered the other two plants for several years had convinced the wheel company's officials that they could buy power cheaper than they could make it themselves.

Aluminum Lines Go To Manufacture Munitions.—Arrangements have been completed by the Ontario (Canada) Hydro-Electric Commission for the disposal of around 80,000 lb. of aluminum for the manufacture of fuses and munitions. Copper wire is being substituted for the aluminum wire.

World's Largest Private Branch Telephone System.—The contract has been signed between the New York Telephone Company and John McE. Bowman, representing the Hotel Commodore, for the installation of what is said to be the largest private branch telephone system ever constructed. The Commodore will be one of the largest hotels in the world. The contract provides for a telephone system larger than that serving the whole of Greece, and fully as large as the telephone development of the average American city of 20,000 inhabitants. A 26-position common battery switchboard, equipped to serve 2400 extension stations is to be installed, and approximately 1,000,000 local messages are contracted for.

Chicago, Milwaukee & St. Paul Adds 110 Miles to Electric Line.—Announcement was made a few days ago that the Chicago, Milwaukee & St. Paul Railway has added 110 miles to its electrically operated lines in Montana. The last stretch of track turned over to electric operation extends from Deer Lodge to Alberton, Mont., and is the third unit to be changed over from steam to electric operation. Work on the fourth and last unit between Alberton, Mont., and Avery, Idaho, is now being completed and when that is ready, about the first of the year, the St. Paul will have 440 miles in operation.

To Test Right of Power Company to Levy Non-Payment Penalty.—With a view of testing the legal right of the Consumers Power Company to charge a penalty of 10 per cent for non-payment of monthly bills for electricity, suit has been brought against the corporation, asking judgment of 7 cents. In the bill of complaint it is alleged that on Nov. 8, 1916, the company forced the plaintiff to pay "68 cents for 9 kw.-hr. current consumption, and in addition a 10 per cent penalty of 7 cents, a total of 75 cents." The bill was paid under protest and the plaintiff charges it was collected, while the company has no authority of law to collect from him any 10 per cent penalty in addition to the service bill.

Duties of a 3-hp. Motor.—Demonstrating almost the extreme in efficiency for farm power motors, a letter concerning the duties of a 3-hp. electric motor in the Arkansas Valley, Colo., which is served by the Arkansas Valley Railway Light & Power Company, states that this particular small power unit is accomplishing the following: Pumps water for 3500 head of sheep, twenty-seven head of cows, fifty head of hogs; drives a milking machine which milks twenty head of cows twice each day; drives a cream separator which handles the entire output of milk; drives a corn grinder which is used twice daily. And the owners are making arrangements to connect the motor to a cucumber seed cleaning machine.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Radio Club of America.—The November meeting of the club was held on Nov. 17, at Columbia University, New York City. Harry Sadenwater presented a paper on "The Cohen Electrostatically Coupled Receiver and Its Application to Regenerative Audion Circuits."

Meeting of Brooklyn Student Branch, A. I. E. E.—A meeting of the Polytechnic Institute of Brooklyn Branch of the American Institute of Electrical Engineers was held on Nov. 17. F. Smith of the New York Telephone Company gave an illustrated lecture entitled "The Telephone Girl."

Talk on Consolidation at Dallas Meeting.—E. B. Neiswanger, construction engineer, Texas Power & Light Company, addressed the club on "The Importance of Consolidation" as regards public utility electrical properties on Nov. 10. Mr. Neiswanger brought out the economic value to the State and to the people as a whole, which results from consolidation.

Constitutional Amendment for Chicago Club.—The amendment to the constitution of the Chicago Electric Club and Jovian League was scheduled to come up at this week's meeting. The committee on the amendment recommended the consolidation of the offices of secretary and treasurer into one office. Jack Lait of the Chicago *Herald* addressed the club on Nov. 16.

British Columbia Contractors and Dealers Hold Dinner Meeting. — The British Columbia Association of Electrical Contractors and Dealers held a dinner meeting on Oct. 26, at the Castle Hotel, Vancouver. Mr. Hayward, president of the Victoria chapter of the association, spoke on "Overhead Cost and Profit." Addresses were delivered by W. McNeill, assistant general manager, Western Canada Power Company, on "Co-operation in the Electrical Industry," and by George Kidd, general manager, B. C. Electric Railway Company, on "Electrically Operated Railways."

Dallas Mayor Talks to Jovians on Franchise Problem.—Mayor Henry D. Lindsley of Dallas, Tex., on Nov. 17 spoke before the local Electric Club and Jovian League on the "Franchise Problem."

Worcester Polytechnic Institute Branch A. I. E. E.—The second regular meeting of the Worcester Polytechnic Institute branch of the American Institute of Electrical Engineers was held on Nov. 17. In accordance with the usual custom, this was the annual "Ladies' Night" of the branch. Stuart M. Anson, the Worcester representative of the Westinghouse Electric & Manufacturing Company, presented two railway films which showed the overhead construction, the types of locomotives used, and the character of the trains hauled over the electrified sections of track of the Norfolk & Western, the Pennsylvania, the Boston & Maine, and the N. Y., N. H. & H. railroads. As each lady entered the lecture hall she received a number, and immediately after the pictures a drawing contest was held. In this manner three gifts were disposed of. The first gift was a sewing-machine motor, presented by the Westinghouse Electric & Manufacturing Company; the second a percolator, presented by the E. W. Ham Electric Company; and the third, a toaster stove, presented by the Worcester Electric Light Company.

Sperry Addresses New York Electrical Society.—Past President Elmer A. Sperry delivered an address on his new high-intensity searchlamp before the New York Electrical Society at a meeting in the Sperry Building, Brooklyn, N. Y., on Nov. 22. About 350 members were present continuing the large attendance of the past two years.

Athol Employees Open Winter Season. — On Nov. 1, the opening of the Athol (Mass.) Gas & Electric Association's social season of 1916-1917 was celebrated by a meeting held at the home of the local manager, A. A. Laughton. An innovation—that of inviting the wives of the members—contributed in a large measure to the success of the occasion. The guest of the evening was C. A. Ware, manager of the Gardner (Mass.) Electric Light Co., who read a paper entitled "What the Central Station Expects from Its Employees, and What the Employees Should Expect from the Central Station Which Employs Them."

Los Angeles Electrical Engineers Hold Get-Together Dinner. — The annual get-together dinner of the Los Angeles section of the American Institute of Electrical Engineers was held at Christopher's Café on Nov. 14. "Where Are We At Electrically?" was discussed as follows: "K. W. Hot and Cold," by E. E. Valk, engineer, General Electrical Company; "Juice En Transit," by Prof. R. W. Sorenson, Throop College of Technology; "Transportation," by Julian Adams, assistant electrical superintendent, Pacific Electric Railway; "H. P. A. La Motor," by C. P. Walker, engineer, Westinghouse Electric & Manufacturing Company; "Hello Stuff," by L. A. Vary, equipment engineer, Pacific Telephone & Telegraph Company; "Candle Power De Luxe," by W. D'Arcy Ryan, illuminating engineer, General Electric Company; "Electrocutioner," by George Damon, dean, Throop College of Technology.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

SYSTEM FOR MARKETING LAMPS PROVES BENEFICIAL

By Selling to Distributers on Consignment Only Manufacturers Have Been Able to Prevent Overstocking

For a number of years all Mazda lamps have been sold to distributers on consignment. The manufacturers collect for the lamps only after the distributers have sold them. By so doing the lamp manufacturers own all stocks of lamps in the hands of their distributers.

While this involves a tremendous amount of unproductive capital invested in unsold lamps, it creates a very satisfactory market condition which has been of special advantage to the trade this year; reference is had to the control of stock by the manufacturers. By having a stock so liquid there is little opportunity for overstocking on the part of the distributer. The advantages of this are twofold. First, the manufacturers are faced with a better situation in regard to credits, and second, the trade knows that it will have its individual share of lamps in the unsold stock.

With manufacturing facilities as swamped as they have been during the past year it has been very difficult for the manufacturers to supply the trade adequately. Nevertheless no one had an over supply. When it was felt that a distributer had a greater supply of lamps than was his share of the total, he was requested to return all over that share. The lamps returned were then parcelled out to the trade.

In this way no one had his competitor at a serious disadvantage. It has cost the manufacturers millions of dollars tied up in stock, but the trade feels the fairness of such a marketing system especially in these times.

TRADE ACCEPTANCES

Present Time, Being a Sellers' Market, Is the Most Favorable to Inaugurate System

That trade acceptances have value and merit is recognized but sellers have hesitated to put the acceptance machinery in motion fearing that the buyer might take offense and remove his account to the seller's competitor. Until this past year the seller was undoubtedly right. It was for long a buyers' market and the seller had to be very careful not to offend in the least way.

To-day the situation is different. The market technically is now in control of the seller. The buyer is willing to do almost anything within reason in order to get merchandise. Without a doubt no better time ever existed for the seller to institute changes in his system. The seller has the opportunity he never had before and probably will never have again to inaugurate the trade acceptance system.

No buyer need change his time of payment. The buyer may choose to pay in thirty or sixty days as formerly. The only difference will be that the seller will know that he is going to get his money when the buyer says he will.

The buyer will find, however, that there will be no disputing the bill at the end of the discount period. The acceptance is drawn on him for a definite sum of money payable on a certain date and he accepts it by so writing on the face of the draft. Also the buyer will not be able at the end of say ninety days to remit part of his bill and the rest in unsold goods. In more ways than one will the system protect the seller from dishonest and unscrupulous buyers.

Undoubtedly many sellers are anxious to put this plan into effect but yet hesitate for fear of apparent evil consequences. So great is the demand for electrical goods to-day that no seller need fear losing an account. It is not so easy nowadays to transfer accounts as in the past. Furthermore, preference in delivery is very efficient bait. It is doubtful if many buyers would hesitate to accept their debts if delivery was the price. Nor would the seller be taking an unfair advantage. Rather would he be protecting those whose credit is best and who by this credit best protect his liquid assets.

MARKET FOR WATER-WHEELS IN NEW ENGLAND STATES

Redevelopment of Old Powers Brings Brisk Demand for Hydroelectric Units of Small Rating

Before the war small water powers were going to waste through disuse in New England probably more than in any other section of the country. These states had been rather extensively developed. Manufacturers relied to a large extent upon these small water powers to furnish them with their power. However, lack of water at certain seasons, the coming of cheap central station power and other causes, were responsible for many of these small powers going to waste through disuse.

Other plants kept their wheels turning, using the same old inefficient apparatus with which the developments were equipped many years ago. There had been no factories swamped with orders month after month.

Now, however, the maximum of power is necessary with the minimum waste. No chance can be taken on the apparatus failing. For this reason in addition to the abandoned plants a number of plants still in use have rehabilitated their water-wheel equipment. Old wheels that have been driving generators through gears and belts are being replaced by direct-connected turbine-generator units. The demand, it is understood, is large while the field is practically undiminished.

Much of the present activity in this field has been on the part of small central stations which needing more power have begun to utilize existing water powers.

WAGES ADVANCED BECAUSE OF HIGHER LIVING COSTS

Labor by Accepting New Scale Makes Unexpressed Agreement Which May Prove Solution of Labor Problem Expected When Market Falls Off

Within the past ten days numerous instances have come to light where manufacturers of every kind are voluntarily increasing the wages of their employees. In almost every case the reason that was given was the high cost of living. It was clearly recognized that with food prices and prices of other necessities so much more than last year that the existing scale of wages was insufficient. Added to a pay-roll already greatly swollen by higher wages the present advance, which has for the most part been 10 per cent, will increase still further the labor cost of manufacture. In many cases the present advance is the second or third increase to go into effect this year. The other increases were mostly given under the bonus or profit-sharing systems.

While the movement has but started it is felt that it will be general. Of these factories which will not grant the advance voluntarily labor will undoubtedly demand it.

In view of the condition which is bound to come after this market is played out when prices will be down again, the present action should be significant. If capital makes a precedent of increasing wages to meet the increasing cost of living and labor accepts it, then it is logical to assume that labor tacitly admits that wages should to a certain extent be

dependent upon the cost of living. If labor lives up to this unexpressed but nevertheless accepted agreement then the labor problem to be met when the market falls off and the consequences of which capital is fearful would seem to be solved.

On the other hand, this is the first indication that capital is willing to increase wages in proportion to increased living expenses. Nevertheless it is not improbable that should the cost of living advance much further that labor will expect a further increase in wages.

RUBBER-COVERED WIRE SITUATION IMPROVING

New Policy of Buying at the Delivery Market Offers Advantages of Rising Prices and Tends to Stabilize the Industry

Manufacturers and jobbers are making a better profit in rubber-covered wire to-day than ever before. The demand is large and the output is not sufficient. Rubber-covered wire, being a staple, never was very profitable for the jobber. Until quite recently it was sold on a basis of the best price. Thus a buyer would place an order at to-day's prices, say 21 cents, for four months' delivery. If at the delivery date the prevailing price was 18 cents the buyer expected this price and received it although the contract was made at 21 cents. If, on the other hand, the price had advanced to 23 cents the buyer held to the contract price of 21 cents. The buyer therefore was protected against any advance in the market but he also received the benefit of any decrease in market prices.

Under such a scheme it was nothing more than heads the buyer wins, tails the seller loses. With the margin of profit always small it often reached the vanishing point on a rising market. To-day, however, all of this has been changed. Wire is bought at the delivery market price of copper-wire base. The jobber buys this way from the manufacturer and the contractor from the jobber. The benefits of a rising market are now going to the seller.

A question arises, however, of just how much of this apparent profit can be counted a real profit. Just so sure as more money is made on a rising market just so sure is less money made on a falling market. If stocks are small and the decline very gradual the drop in profits is very small. If stocks are large and the bottom falls out of the market then instead of a profit a loss is taken. If the market recedes in the same manner and rate it advanced and if stocks were the same in both cases then the increase in profit on the rising market would just offset the decrease in profit on the falling market.

With copper wire in which there is a very definite market price the fluctuations in the market price of copper now have a decided influence on profits. A number of sellers are now using a large part of the increased profits due to the rising market as reserves to be used as an offset for the lessened profits when the market begins to go down. In these cases the profit is really not large; for the apparent profit is divided into a real profit and a reserve.

CREDIT RISK OF TRADE NAMES

Necessity Emphasized for Carrying an Account Under the Name of the Proprietor

An inquiry into the risk of carrying accounts under trade names such as "electric shop" has been made by the National Electrical Credit Association, and a number of credit men have responded with an expression of their ideas and experiences.

It is a common practise to-day to open an account under the trade with no information concerning those who legally are responsible for the firm's debts. The salesmen have not been instructed to find out if a firm is a corporation, partnership or sole trade. In fact, many salesmen sign orders themselves with the buyer's trade name.

Should the shop change hands the manufacturer has no redress. The account is simply bad. Unless the account is taken in the name of the person or persons constituting the firm it has been the experience of many that it is almost impossible to make collection should the ownership change hands in the meanwhile.

DELIVERIES BY EXPRESS

Shortage of Freight Cars Frequently Necessitates Quicker Means of Transportation

One of the most serious problems that is confronting the manufacturer to-day and which is daily growing more serious is that of transportation both of the raw materials and the finished product. Shortage of freight cars, which is now well over 100,000 cars, is proving a decided handicap. Formerly three or four days were necessary to get a freight shipment that now takes three or four weeks and quite frequently longer.

For this reason manufacturers are increasing daily the shipment of goods and delivery of small lots of raw materials or manufacturing materials by express. A problem has therefore come up which is not easy to solve, and as time goes on it is becoming more and more serious. The manufacturer is asking for express shipments instead of freight shipments on small lots of manufacturing materials and is paying the higher cost. When, however, he ships goods by express that were contracted for to be shipped by freight, the buyer does not expect to pay the increase. The manufacturer is therefore faced with the problem of making the buyer pay the higher charges and incurring his displeasure, or of assuming the costs himself. As a rule the manufacturer, in anticipation of the buyer's market that is to follow this seller's market, chooses the latter course. Furthermore, the manufacturer feels that he should ship by express if it will save perhaps a month or more when an old customer writes in that he is urgently in need of the goods which are already many weeks behind in delivery.

By paying the higher transportation charges in both directions the manufacturer finds his profit considerably lessened.

While deliveries are now far longer than normal it is not a condition for which the manufacturers are largely responsible. Factors over which the manufacturer has no control, such as labor and raw material, have been largely instrumental in bringing this about.

It seems logical, therefore, to expect that one of two things will ultimately result if these conditions continue to prevail and there is no possibility at present of any change for the better. Either the manufacturer must raise his prices sufficiently to take care of these increased transportation charges; or there will have to be some definite understanding, between the trade and the manufacturer, that prices will be quoted at the factory, the trade to pay all transportation charges.

ENGLISH CATALOGS FOR DEVELOPING EXPORT TRADE

Commission Agent Form of Marketing Goods Prevails—Consumer Reached by Agents' Literature in the Native Language

With the exception of a few very large firms that manufacture several lines, the American electrical manufacturer is practically forced to cultivate the export market not with his own trained force of salesmen, but through commission merchants. These latter trade in a number of different lines for which they act as sole agents.

A canvass made of a large number of these firms with offices in this country disclosed some interesting points in connection with the exploitation of the export market. The generally-accepted and well-advertised notion that catalogs of the American manufacturer must be translated into the language of the country in which business is sought was shattered. Export commission merchants want American catalogs written in the English language. Of these perhaps half a dozen are wanted, one each for the home and district offices, and not for general distribution.

If any catalog is for general distribution it is that of the commission merchant, who like the jobber puts out a catalog listing all of the apparatus and appliances for which he is agent. These catalogs are in the language of the people.

Manufacturing and Industrial

Altorfer Brothers Company recently moved from Roanoke, Ill., to Peoria, Ill., where the company has erected a large washing-machine factory. The company reports an excellent demand for its vacuum electric washing machine.

The Electric Porcelain & Manufacturing Company, Trenton, N. J., has acquired the plant of the Climax Pottery Company on New York Avenue, as a new factory for the manufacture of its electric porcelain specialties. A new addition, about 130 x 150 ft., will be erected at an estimated cost of $70,000. H. T. Paiste, Philadelphia, is president.

King Foundry Company, manufacturer of White Way lighting standards, has moved the entire sales office from St. Joseph, Mo., where the company's factory is located, to 927 Monadnock Block, Chicago. H. L. Dollahan, who is sales manager of the company, will be in charge of the office and henceforth the sales policy will be controlled from Chicago.

The Powdered Coal Engineering and Equipment Company of Chicago, Ill., has engaged Norman L. Warford in the capacity of engineer of construction. Mr. Warford has had an extensive plant experience, having installed the largest powdered coal plant in the United States for the Anaconda Copper Mining Company at its several works in Montana, wherein approximately 1,000 tons of pulverized fuel is burned daily.

Belden Employees Share in Profits.—The board of directors of the Belden Manufacturing Company of Chicago has distributed the first employees' bonus under the new profit-sharing plan which it inaugurated some time ago. The distribution was based on each employee's proportionate share of the payroll. Although Joseph C. Belden, president of the company, declined to state what was the total amount distributed, he said that about 600 employees received bonuses.

Russian Platinum Production.—During the current year production of platinum in the Ural Mountains, Russia, has been seriously affected by the scarcity of labor in the case of hand washings, and in the case of mechanical dredging plants by the difficulty in obtaining spare parts for dredges. The production of platinum in 1916 is estimated at 3600 to 4300 lb., or one-third of the normal production. To this decrease in output, as well as to speculation and the great demand in the United States for this metal, may be attributed the rise in the price of platinum.

Intensive Drive on Automobile Engine Heaters. — The Hughes Electric Heating Company, Chicago, is now executing a short but intensive effort to sell electric heaters for automobile engines and carburetors. After a three days' sales conference the heater salesmen started out on Nov. 1 to call on as many electrical, hardware and automobile accessory jobbers as possible. In addition to dealer helps, advertising both national and local is being used. A number of central stations and department stores have also put on special heater campaigns for November and December.

Changes in Western Electric District Managers.—F. B. Gleason, formerly in charge of the Western Electric Company's business in the Far East, with headquarters at Tokio, Japan, has been appointed manager of the southern district of the Western Electric Company, with headquarters at Atlanta, Ga. He will succeed E. J. Wallis, who, on Jan. 1, will take up his new work as manager of the Pacific coast district, with headquarters at San Francisco. Mr. Wallis will succeed F. H. Leggett, who, after three years on the coast, returns to the company's executive offices at 195 Broadway, New York City.

The **Deane Steam Pump Company** of Holyoke, Mass., it is reported, will shortly expend about $1,000,000 in the enlargement and reconstruction of its local plant. The Newburyport (Mass.) branch of the Worthington company is to be discontinued and the business concentrated at Holyoke. Rush of business at the Holyoke plant still continues and it has recently been ascertained that a war order of pumps representing an outlay of $250,000 has been filed at the plant. Press dispatches state that a previous order to this amount was shipped to Europe some weeks ago, but that the shipment was sunk with one of the vessels which were sent to the bottom by the German submarine raider U-53 on Oct. 8.

Head of G. E. Pittsfield Welfare Work Lectures on Safety.—Prof. Sydney W. Ashe, head of the educational and welfare department of the Pittsfield works of the General Electric Company, lectured on Nov. 14 before the safety engineers of the Consumers' Power Company of Jackson, Mich. An experimental lecture showing the relation of light to safety was given, supplemented with lantern slides showing the ruggedness of construction of transformers and the special winding features developed at the Pittsfield works in recent years, to insure the greatest possible safety in operation. The lecture was illustrated with many experiments and concluded with a discussion of safety and first aid work, during which further slides were shown covering this work from an educational standpoint as followed at Pittsfield.

Change in Milwaukee Engineering Firm.—The firm of Vaughn, Meyer & Sweet, consulting engineers, Majestic Building, Milwaukee, Wis., has recently changed its organization, returning to the original firm name of Vaughn & Meyer after a recent dissolution and the withdrawal of Arthur J. Sweet from the firm. Francis A. Vaughn and Hans J. Meyer, members of the firm of Vaughn & Meyer, have joined in partnership with Charles L. Pillsbury, of the consulting engineering firm of the Charles L. Pillsbury Company, 805-11 Metropolitan Life Building, Minneapolis, Minn., and 716-20 Capital Bank Building, St. Paul, Minn. Mr. Vaughn and Mr. Meyer will continue to conduct their Milwaukee offices under the firm name of Vaughn & Meyer, and the Minneapolis offices will be conducted under the present firm name of Charles L. Pillsbury Company. The headquarters of Mr. Pillsbury and Mr. Meyer will be in the Minneapolis office; those of Mr. Vaughn in Milwaukee. The work of the three offices covers a wide range of engineering activities and the combined organization will be able to serve an extensive field.

Jobber-Dealer Co-operation.—An interesting step toward co-operation with the electrical dealer has just been taken by a prominent jobber in Chicago. Acting upon the theory that the dealer in buying would give preference to those who assisted him most practically in marketing his goods, the jobber is furnishing a forty-eight page catalog containing a selected variety of household appliances, portable lamps, toys, flashers and household utilities, to the dealer with his imprint, with an initial order for his Christmas stock. The dealer's name appears on the front and is the only name appearing anywhere in the book. It is just as much an individual catalog of the dealer who distributes it as if he paid for it himself, which would be out of the question as the composition alone would cost several hundred dollars. The advantages to the dealer are many. He can concentrate his sales upon the articles listed and by so doing simplify his stock and make it easier to purchase. He will know what each item sells for and what the profit is. He will be assured that at least one company is carrying the material in stock. The Central Electric Company, which is trying out this experiment, is confident that the dealers will recognize this sales assistance and that it will tend to establish a closer relationship between them.

NEW YORK METAL MARKET PRICES

	Nov. 14 Selling Prices Bid	Nov. 14 Selling Prices Asked	Nov. 21 Selling Prices Bid	Nov. 21 Selling Prices Asked
	£ s d	£ s d	£ s d	£ s d
London, standard spot	128 0 0		144 0 0	
Prime Lake	31.50	to 32.00†	33.50	to 34.00†
Electrolytic	32.00	to 33.00†	33.50	to 34.00†
Casting	30.00	to 30.50†	32.50	to 32.75†
Copper wire base	37.25†		39.75†	
Lead	7.00		7.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	17.00		19.00	
Spelter, spot	11.42½	to 11.55	12.42½	to 12.67½
Tin, straits	44.37½		45.25	
Aluminum, 98 to 99 per cent	58.00	to 60.00	58.00	to 60.00†

OLD METALS

Heavy copper and wire	24.50	to 25.00†	25.00	to 26.00†
Brass, heavy	14.75	to 15.00†	14.50	to 15.00†
Brass, light	11.00	to 11.50†	11.00	to 11.50†
Lead, heavy	6.25	to 6.37½†	5.87½	to 6.12½†
Zinc, scrap	7.25	to 7.75†	7.75	to 8.00†

COPPER EXPORTS

Total tons to Nov. 21 13,210

†Nominal.

Corporate and Financial

Central Illinois Public Service Company, Mattoon, Ill.—An issue of $4,000,000 of first and refunding mortgage 5 per cent gold bonds, due Aug. 1, 1952. is being offered at 90 and interest.

Houston (Tex.) Lighting & Power Company—A new issue of $150,000 of first mortgage 5 per cent sinking fund gold bonds due April 1, 1931, is being offered to investors at par and interest.

Hydraulic Power Company of Niagara Falls, N. Y.—An issue of $3,000,000 of refunding and improvement mortgage 5 per cent gold bonds, dated Oct. 1, 1916, and due Oct. 1, 1951, is being offered at 99.5 and interest.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—The Republic Railway & Light Company has sold to bankers $3,500,000 preferred stock of its subsidiary company, the Mahoning & Shenango Railway & Light Company. Approximately $3,000,000 of this amount is held as collateral under the $3,000,000 note issue of the Republic company, and from the proceeds of the sale of this stock the Republic company will pay off the entire note issue, which is due Dec. 1, 1918.

Narragansett Electric Lighting Company, Providence, R. I.—Shareholders of record Nov. 25 may subscribe pro rata for 20,000 shares ($50 par value) to be dated Jan. 2, 1917. At present the capital stock of the company is $7,500,000.

Pacific Gas & Electric Company, San Francisco, Cal.—Operating revenues for the first nine months of the current year showed a gain in comparison with the corresponding period of 1915 of over $400,000. The company has signed up, but not connected, 12,000 hp. of business, and there is 21,000 hp. additional under negotiation. Ten contracts recently obtained, which have not yet contributed to the revenues of the company, are estimated to yield a minimum of $276,000 a year.

Philadelphia (Pa.) Electric Company.—At a meeting of directors a few days ago it was decided to call a final assessment of $2.50 per share, making the stock full paid $25, and payable Dec. 16, 1916. Directors declared the regular quarterly dividend of 1.75 per cent, payable Dec. 15 to stock of record Nov. 24.

Virginia Railway and Power Company, Richmond, Va.—The gross earnings, income and disbursements of the combined properties, owned, leased and operated by the company for the year ended June 30, 1916, after excluding offsetting transactions between companies and departments, are given below:

	June 30, 1916	June 30, 1915
Gross earnings	$5,645,158	$5,109,622
Operating expenses	2,676,179	2,469,074
Operating revenue over operating expenses	$2,968,979	$2,640,548
Other income	96,610	80,919
Gross income	$3,065,589	$2,721,467
Taxes and licenses	327,631	298,551
Income applicable to fixed charges and rentals	$2,737,958	$2,422,916
Fixed charges and rentals:		
Interest on outstanding funded debt	$1,195,650	$1,136,120
Sinking fund payments	120,386	100,614
Norfolk Railway & Light rental	99,000	99,000
Other interest	.....	2,133
Total	$1,415,036	$1,337,867
Surplus over fixed charges and rentals	$1,322,922	$1,085,049
Other charges:		
Depreciation charged direct to current year's surplus	$100,000	$100,000
Proportion of discount on sale and purchase of bonds and other securities	30,316	29,261
Net miscellaneous charges not operation, charged direct to surplus	38,488	33,284
Total direct charges	$168,804	$162,546
Surplus over fixed and other charges	$1,154,118	$922,503
Applied as follows:		
Dividends on stock:		
Preferred stock	$472,752	
Common stock	358,482	
Total	$831,234	
Net surplus for the year after paying dividends	$322,884	

New Utility and Industrial Companies

The Lawndale (N. C.) Power Company has been chartered with a capital stock of $100,000 by J. F. Schenck, Sr., J. F. Schenck, Jr., and others.

The Butler (Ga.) Light & Power Company has been incorporated by J. A. Childs, G. C. Smith and others. The company is capitalized at $3.000.

The Long Power & Supply Company of Clarksburg, W. Va., has been incorporated with a capital stock of $5,000 by J. Edgar Long, H. B. Cooper, Sidney Britt and others.

The Yosemite Power Company of San Francisco, Cal., has been incorporated with a capital stock of $10,000,000 by John Coffee Hays of Visalia, Cal.; Lester R. Wiley of Bangor, Me., and Albert Raymond of Berkeley, Cal.

The American Steam Conveyor Corporation of New York, N. Y., has been incorporated with a capital stock of $55,000 to manufacture and deal in pneumatic, automatic, hydraulic, steam, electric machinery, tools, implements, devices, etc. The incorporators are: S. A. Anderson, S. B. Howard and A. W. Britten, 28 Nassau Street, New York, N. Y.

The Inter-Continental Machinery Corporation has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $500,000. The company, it is reported, will deal in machinery in general, but will specialize in machine tools both in United States and foreign countries. Charles N. Thorn is president; Joseph S. Clark, vice-president, and Arthur M. Watkins, secretary.

Trade Publications

Motor Generators.—Bulletin No. 129, descriptive of Type "B" a.c.-d.c. and d.c.-d.c. battery charging motor generators, has recently been distributed by the Robbins & Myers Company, Springfield, Ohio.

List Prices.—Sales data memorandum 15-F, dated Nov. 6, 1916, giving changes in list prices and standard package quantities since the issuance of catalog No. 15, is being distributed by Harvey Hubbell, Inc., Bridgeport, Conn.

Stokers.—The Laclede-Christy Clay Products Company, Manchester and Sulphur Avenues, St. Louis, Mo., has distributed an attractive folder telling how the problem of making four boilers equal six was solved. This folder is illustrated and has been carefully prepared.

Sockets.—The Cutler-Hammer Manufacturing Company of Milwaukee has prepared a large window or counter display lithographed in six colors. This display shows in an attractive manner the C-H push socket, some of its advantages and uses. The display cut-out is 21 in. high and about 18 in. wide and stands alone.

Trumbull Mazda Lamp Company, Youngstown, Ohio, has awarded the contract for the construction of an addition to its plant which will cost $75,000. The addition will be three stories high, and will include a considerable amount of new equipment, and such innovations as a reading room and dispensary for employees, and a cafeteria.

Telephones.—Intercommunicating telephone systems is the title of bulletin No. 1017 recently brought out by the Stromberg-Carlson Telephone Manufacturing Company of Chicago, Ill. This describes a type of system for the majority of offices, factories, public buildings and large residences where the volume of traffic necessitates simultaneous conversations, yet it is not large enough to justify the use of a switchboard system and the salary of an operator.

Conduits.—A representative book on conduit installations concerning McRoy-Camp conduits has been very carefully prepared by the National Fireproofing Company of Pittsburgh, Pa. This book contains valuable information on materials for underground conduit, importance of glaze in ducts, drainage of the conduits, electrolysis, ducts and fittings, conduit installation, manholes and many other interesting data relating to conduits. Railway signaling systems and costs of underground construction will also be of interest to the underground engineer. This book should be of interest to every electrical engineer and others interested in this line of work.

New England

MILFORD, N. H.—The Milford Light & Power Company has closed a contract with the Smalley Granite Company to supply electricity to operate the Souhegan Quarry. The Milford company will erect an electric transmission line to furnish the service.

BOSTON, MASS.—The installation of a 12,000-gal. electrically operated pumping station on Commercial Street for the high-pressure water system of Boston is recommended by the special committee of the Chamber of Commerce, appointed to investigate this problem. The cost is estimated at $175,000.

BOSTON, MASS.—Bids will be received at the office of the Massachusetts Board of Education, Room 217, State House, Boston, Mass., until Dec. 4, for furnishing heating and ventilating apparatus, installing plumbing and fixtures, installing electric wires and fixtures, for installing kitchen equipment and utensils and for installing a mechanical system of refrigeration. Plans and specifications may be obtained at the office of Richard D. Kimball Company, 6 Beacon Street, Boston, upon deposit of $5.

CHELMSFORD, MASS.—The citizens have voted to enter into a contract with the Lowell (Mass.) Electric Light Corporation for a period of five years. Under the new contract 55 new lamps will be added, making a total of 195.

MALDEN, MASS.—Plans for an entirely new arrangement for lighting the streets of the city have been submitted by the Malden Electric Company to the City Council. It is not yet decided whether luminous arc lamps or nitrogen-filled lamps will be used for the ornamental lighting system in the business section.

PITTSFIELD, MASS.—Negotiations are under way between the Pittsfield Electric Company and the Albany Southern Railroad Company of Hudson, N. Y., to connect the two plants for the exchange of power in case of emergencies. The Albany Southern company contemplates extending its transmission lines from Hudson to Pittsfield.

NEWPORT, R. I.—Tests are being made by the Aldermanic committee of different street lamps in connection with the proposed ornamental lighting system for Market Square. Street-lighting service is supplied by the Newport & Fall River Street Railway Company.

PROVIDENCE, R. I.—The Rhode Island Company is contemplating placing contracts for construction of new substations at Oakland and at Harmony. Contracts have been placed for equipment for both substations.

NAUGATUCK, CONN. — Plans have been prepared and material purchased by the United Electric Light & Water Company of Waterbury for the erection of another high-tension transmission line to Naugatuck and Seymour. W. T. Pratt is local superintendent.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 28 for furnishing dry cells, etc., at the navy yard, Brooklyn.

NEW YORK, N. Y.—Bids will be received by Robert Adamson, fire commissioner, Eleventh Floor, Municipal Building, New York, until Nov. 28 for furnishing 50 miles of triple braided, weatherproof, hard-drawn copper wire, No. 10 B. & S. gage.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Park Avenue and Fifty-ninth Street, New York, until Dec. 4 as follows: Item (6) for machine tool equipment; (7) printing shop equipment; (8) small tool equipment; (9) passenger elevators, in the Evander Childs High School, located at East 184th Street and Field Place, borough of the Bronx.

OSWEGO, N. Y.—Preparations are being made by the Stewart Hartshorne Company of Newark, N. J., which recently acquired the property of the Oswego Shade Cloth Company and the Ontario Mills, for the construction of a large electric power plant. The Ralph R. Rumery Company of New York has been engaged to take charge of developing the water power at the Ontario Mills plant.

CHESTER, PA.—The Beacon Light Company has been awarded a contract for lighting the streets and public buildings of the city for a period of five years. All the 16-cp. lamps now in use will be replaced with lamps of 40 cp. or more.

MONACA, PA.—Plans have been submitted to the Council by the Beaver County Light Company of New Brighton for the installation of a new street-lighting system.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

The new system provides for 91 lamps, instead of 63 lamps now in use.

MORRISVILLE, PA.—The East Pennsylvania Gas & Electric Company of Bristol contemplates extending its system to serve the yards of the Pennsylvania Railroad Company in West Morrisville.

PHILADELPHIA, PA.—The Eudore Manufacturing Company is planning to build a new boiler plant at its factory on Sixty-third Street, to cost about $7,500.

PHILADELPHIA, PA.—The Philadelphia Electric Company is considering the construction of a new electric generating plant in the Kensington section, to cost about $4,000,000.

PHILADELPHIA, PA.—James F. McLaughlin, chief of the electrical bureau, has recommended the installation of 17 new elevators in the City Hall, to replace the old elevators (operated by hydraulic power). The cost is estimated at $425,000.

PITTSBURGH, PA.—Bids will be received by George W. Gerwig, secretary board of education, Fulton Building, Pittsburgh, until Dec. 5 for construction of the Westinghouse high school building, located on Monticello Street and Mutland Avenue. Separate bids to be submitted for plumbing, heating and ventilating, electric wiring, etc. George S. Orth & Brother, Farmers' Bank Building, Pittsburgh, are architects.

PITTSBURGH, PA.—The State Water Supply Commission has approved the application of the Pittsburgh Hydro-Electric Company to construct a dam 220 ft. high, on Big Sandy Creek, a tributary of the Cheat River, within a few miles of Morgantown, W. Va. It is proposed to impound the waters of the creek for a distance of 8 miles, lying partly in Pennsylvania and partly in West Virginia. The power houses will be located at the mouth of Little Sandy Creek.

SHAMOKIN, PA.—The Pennsylvania Lighting Company has applied to the Borough Council for permission to erect a condensing plant in connection with its power plant on West Water Street.

STROUDSBURG, PA.—The Stroudsburg Electric Light & Power Company has been awarded contracts for lighting the streets of the boroughs of Stroudsburg and East Stroudsburg for a period of five years. Under the new contracts the lamps now in use in both boroughs will be replaced with gas-filled incandescent lamps of 400 cp. In Stroudsburg the number of lamps will be increased from 88 to 132, and in East Stroudsburg 133 lamps are provided.

UPPER DARBY TOWNSHIP, PA.—The Philadelphia Suburban Gas & Electric Company of Philadelphia has acquired a site in Upper Darby Township on which, it is reported, it will erect a new power plant.

HOPEWELL, N. J.—Mayor H. A. Smith is conferring with the Public Service Electric Company for improvements to the local lighting service.

NEWARK, N. J.—The J. H. Meyer Tire Duck Company, 50 Union Square, New York, is planning to build a large boiler plant, at its new cotton weaving factory, to be erected on Freylinghuysen Avenue, at a cost of about $100,000.

PATERSON, N. J.—Bids, it is reported, will be received by the Board of Works of Paterson until Dec. 4 for furnishing and installing an 80-kw. steam turbo-generator unit. S. V. S. Muzzy is president of board of works.

WASHINGTON, N. J.—Plans are being considered by the Washington Electric Company for improvements to its local street-lighting system.

CHARLESTON, W. VA.—The Charleston Interurban Railroad Company is contemplating extending its electric railway from Cabin Creek to Montgomery, a distance of 10 miles.

HUTCHINSON, W. VA.—Arrangements are being made by the Monongahela Valley Traction Company for increasing the output of its power plant at Hutchinson. Contract, it is understood, has been placed for an additional 1150 kw. generating unit. The addition to the power station will provide space for the installation of two additional units when needed.

MORGANTOWN, W. VA.—The Morgantown Interurban Railway Company is contemplating the construction of an electric railway from Morgantown to Port Marion, Pa., a distance of 20 miles. J. McDermott, Price Building, Morgantown, is reported interested.

RICHMOND, VA.—The construction of an electric railway from Richmond to Forest Hill and Bon Air, a distance of 7 miles, is under consideration. T. S. Wheelwright, president of the Virginia Railway & Power Company, is reported interested.

ROANOKE, VA.—The Norfolk & Western Railway Company contemplates equipping its main line from Vivian to Farm, W. Va., about 11 miles; also an extension up the Tug Fork branch from the Junction near Welch to Wilcoe, W. Va., about 5 miles, and an extension on the Bluestone branch from Cooper to a point a mile beyond Simmons, 3 miles, for electrical operation. Part of the work will be done by the company's own forces and part by the forces of Gibbs & Hill, electrical engineers, New York, N. Y., who have been engaged to supervise the construction.

SHENANDOAH, VA.—The citizens have voted to enlarge and extend the service of the municipal electric-light plant.

WASHINGTON, D. C.—Bids will be received at the Department of the Interior, Washington, D. C., until Dec. 6 for furnishing refrigerating machinery, moving and remodeling the present refrigerating plant for the St. Elizabeth Hospital, Washington, D. C. Plans and specifications may be obtained from the chief clerk of the department.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Portsmouth, N. H., Schedule 389—16 four-cycle gasoline engine. Newport, R. I., Schedule 384—for furnishing and installing two outfits for carrying away smoke and fumes; Schedule 382—miscellaneous annealed seamless copper tubing; Schedule 383—600 air pressure gauges; Schedule 390—two grinding machines. Washington, D. C., Schedule 381—one 5-hp. induction motor; Schedule 391—two grinding machines, one grinding machine (10 in. by 24 in.), one heavy milling machine, one universal milling machine, one high power milling machine, three bench milling machines. Norfolk, Va., Schedule 388—2280 lb. phosphor bronze wire; Schedule 387—miscellaneous brass tubing, various diameter. Indian Head, Md., Schedule 381—one iron casting, single-stage centrifugal pump. Brooklyn, N. Y., Schedule 395—miscellaneous plunger pumps. Applications for proposal should designate the schedule desired by number.

North Central

CONSTANTINE, MICH.—The Township Board has granted the Indiana & Michigan Electric Company a 15-year franchise, subject to approval of the voters, to erect a transmission line along the south river road from Mottville Township line to Constantine. The Constantine Hydraulic Company has made arrangements to secure electricity from the Indiana & Michigan Electric Company for auxiliary purposes.

ESCANABA, MICH.—Extensions to the municipal electric-lighting system are under consideration.

ROCHESTER, MICH. — The Detroit United Railway Company has purchased a site at its Lake Orion junction, 1 mile north of Rochester, on which, it is reported, it will erect next season a new power house and car barns.

SPRINGWELLS, MICH.—Bids will be received at the office of Dr. Alfred W. Holmes, treasurer, Springwells. Until Dec. 11 for construction of school building in School District No. 3, including heating, electric wiring and plumbing. Copies of specifications may be obtained at the office of Edward C. Van Leyen, architect, Union Trust Building, Detroit.

BELPRE, OHIO.—The Town Council has granted the Kanawha Traction & Elecctric Company of Parkersburg, W. Va., a franchise to install and operate an electric-light and power system in Belpre.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until Nov. 29 for two 50-kw, alternating-current turbo-generators for the department of public utilities, division of water. Specifications may be obtained upon application to the commissioner of water, Rom 211, City Hall.

COLUMBUS, OHIO—The installation of a new lighting system in the Capitol Building is contemplated by the State House Commission.

COLUMBUS, OHIO.—The board of trustees of the Ohio State University will ask the State Legislature for an appropriation of $200,000 for construction of another

power house on the Ohio State University campus.

FOSTORIA, OHIO—Plans have been approved by the City Council for equipping the waterworks plant for electrical operation, at a cost of about $4,000.

PORT CLINTON, OHIO.—Arrangements have been made by the Matthew Engineering Company, which manufacture electric-lighting plants, to move to Sandusky, Ohio, where it will equip a plant.

RADNOR, OHIO—Bids will be received at the office of the clerk of the Board of Education of Radnor special school district at Radnor, Ohio, until Dec. 9 for furnishing material and erecting a transmission line and transformer stations for serving the centralized school building of said district with electricity for lamps and motors. Energy is to be supplied by the Columbus, Delaware & Marion Railway Company from its station at Radnor. R. W. Jones is clerk.

ST. MARYS, OHIO—Bonds to the amount of $60,000 have been voted for the extensions and remodeling the municipal electric-light plant.

TOLEDO, OHIO—The new building of the La Salle & Koch Company of Toledo, now under construction, will be equipped with an electric-light and power plant. To carry out the plan of forced ventilation, 66 motors will be distributed throughout the building. Contracts for wiring and installation of fixtures have not yet been awarded.

WARREN, OHIO—The Trumbull Public Service Company of Warren has closed a contract with the Trumbull Steel Company to furnish additional power and is now planning to remodel its plant and increase the output of same.

GEORGETOWN, KY.—Bonds to the amount of $100,000 have been voted for the installation of a municipal electric-light plant and water-works system. The service is now furnished by the Georgetown Water, Gas, Electric & Power Company.

HODGENVILLE, KY.—The Hodgenville Lighting Company is planning to install a 2400-volt generator in the spring, and will replace the present 220-volt direct-current service with 110-volt alternating-current service. The generator, it is understood, has been purchased.

FORT WAYNE, IND.—The Board of Public Works has instructed Frank M. Randall, city engineer, to prepare plans for the installation of an ornamental lighting system in Harrison Street.

ALLENDALE, ILL.—The installation of an electric-light plant in Allendale is under consideration. Mr. Greathouse of West Salem is reported interested.

CHICAGO, ILL.—City Commissioner of Gas and Electricity Keith has announced that he proposes to ask the City Council for permission to expend $2,517,100 of the $3,750,000 bond issue, voted last June, for extensions to the street-lighting sytem in the following districts: Northwest, $840,000; Waller Avenue, $633,000; Emerald Avenue, $24,500; Wabansia, $144,200; South Chicago, $845,200, and general, $30,200.

CHICAGO, ILL.—Preparations are being made to establish a central manufacturing community on Thirty-ninth Street, between Ashland and Western avenues, which will involve an ultimate expenditure of approximately $20,000,000. The nucleus of the community will comprise three buildings, a union freight station, a cold storage warehouse and a central power plant, upon which work has already been started or will be within the next month. These buildings will cost about $1,645,000. Work will begin on the new central power plant within the next thirty days, and will be equipped with sprinkler tanks with a capacity of more than 200,000 gal., high-pressure pumps, hot water heaters, coke and ash conveyors and other modern facilities. This building will cost about $250,000. The cold storage building has been leased to Cross, Roy & Saunders for a period of twenty years.

LOVINGTON, ILL.—Plans are being considered for improvements to the municipal electric-light plant.

MOUNT STERLING, ILL.—The installation of a municipal electric-light plant in Mount Sterling is under consideration.

NASHVILLE, ILL.—The Saline Electric Company of St. Louis, Mo., it is reported, has purchased the local electric-light plant and ice factory, owned by K. A. Steinhauser.

PAXTON, ILL.—The City Council is considering plans for the installation of an ornamental lighting system in Market Street.

SAVANNA, ILL.—The Peoples Gas & Electric Company contemplates the installation of a 500 kva. turbo-generator, with condensing equipment in the spring. The company is now erecting a three-phase electric transmission line to Mount Carroll, a distance of 12 miles, where it will sell energy in bulk to the Mount Carroll Electric Light Company. The electric generating plant in Mount Carroll will be closed down.

WINTHROP HARBOR, ILL.—Plans are being considered by the Village Board for the installation of an electric-lighting system.

ALLENTON, WIS.—The local electric-light plant has been purchased by a large utility company, operating in this section, which also has purchased the system at Theresa and Elmira. Transmission lines are being erected to the two latter places and will probably be extended to Allenton.

BANGOR, WIS.—Bids will be received by the Board of Education of Bangor until Dec. 7, for construction of school building. Separate bids to be submitted on electric wiring, plumbing, etc. Plans are on file with Chandler & Park, Architects, Racine, Wis., and Henry Soltan, clerk of board, Racine.

BURLINGTON, WIS.—The Wisconsin Gas & Electric Company is planning to extend its electric transmission lines to the south shore of Brown's Lake.

CAMPBELLSPORT, WIS.—The Wisconsin Gas & Electric Company of Kenosha has petitioned the Railroad Commission for permission to issue $6,500 in capital stock and $7,500 in bonds, the proceeds to be used to acquire the property of the Campbellsport Electric Light & Power Company.

MAYVILLE, WIS.—The capital stock of the Northwestern Light & Power Company of Milwaukee, which owns the Mayville electric plant, has been increased from $5,000 to $35,000. Extensions and improvements to the local system are under consideration. H. J. Schlesinger is president.

MILWAUKEE, WIS.—Plans are being considered for the installation of a new lighting system in the city hall next year.

MILWAUKEE, WIS.—The contract for electric wiring of a factory building (five stories high, 60 ft. by 120 ft.) owned by Briggs & Stratton, 258 Broadway, Milwaukee, has been awarded to Renss & Beyer Electric Company, 55 Oneida Street, Milwaukee. The cost of the building is estimated at $110,000.

PORTAGE, WIS.—Plans are being prepared by the Southern Wisconsin Power Company, First National Bank Building, Milwaukee, for the construction of a power plant in Portage. The proposed plant will have an output of 15,000 kw. Woodmansee & Davidson, 208 South La Salle Street, Chicago, Ill., are engineers.

VALDERS, WIS.—The general contract for construction of creamery (one story, 110 ft. by 215 ft.) for the Wisconsin Condensed Milk Company in Valders has been awarded to W. W. Oeflein of North Milwaukee. Earl F. Miller, Dempsey Building, Manitowoc, is architect.

WHITEWATER, WIS.—The Council is considering the installation of an ornamental lighting system in the business district of the city.

WINDSOR, WIS.—The Wisconsin Power Company is reported to have been granted a franchise to erect an electric transmission line through the township of Windsor. The proposed line will probably be extended from Dane or Portage so as to furnish electrical service in the villages of Windsor, De Forest, Morrisonville, Arlington and Poynette.

ARLINGTON, MINN.—The village of Arlington is considering changing the municipal electric-light plant from direct to alternating current. John Luhring is superintendent.

ELY, MINN.—Preparations are being made by the Kawishiwi River Power Company, recently organized, for the construction of a hydroelectric power plant to develop about 7000 hp. Thomas W. Orbison of Appleton, Wis., is engineer.

HENDRICKS, MINN.—Bids will be received by the Hendricks School Board District No. 64 until Dec. 15 for construction of a brick high and grade school building, including steam heating, electric wiring, fan ventilation, etc. Plans are on file with H. Edward Walker, Architect, 202 Lumber Exchange, Minneapolis, Minn., and A. L. Swenson, Clerk, Henderson.

McINTOSH, MINN.—The local electric-light plant, owned by Anton Jensen, was recently damaged by fire.

NEW FOLDEN, MINN.—The installation of an electric-light plant in New Folden, to cost about $3,500, is under consideration.

NEW ULM, MINN.—A number of extensions are contemplated to the municipal electric-lighting system.

ROCHESTER, MINN.—Plans are being prepared for extending the St. Paul Southern Electric Railway to Rochester, thence to Cresco, Iowa. E. C. Hackett of Rochester has charge of the proposed work.

VIRGINIA, MINN.—The Great Northern Power Company is building an addition to its local plant, and is also contemplating the erection of a 66,000-volt electric transmission line from Thomson to Virginia.

WADENA, MINN.—Work has begun on changing the system of the municipal electric-light plant from direct to alternating current. About one-third will be changed this year and will continue each year until the entire system is completed. The work will include new transformers, etc.; also a change of a number of motors, meters and appliances. James Misner is superintendent.

ALGONA, IOWA.—The purchase of a 200-kva., 2300-volt generator and an oil engine for the municipal electric-light plant is under consideration. A deep-well pump will also be installed next spring.

BRITT, IOWA.—The Britt Light & Power Company contemplates the purchase of a new 100-hp return tubular boiler to replace the one now in use.

CEDAR RAPIDS, IOWA—The Board of Railroad Commisioners has granted the Iowa Electric Company permission to erect and reconstruct electric transmission lines on certain roads and highways in Delaware County.

CEDAR RAPIDS, IOWA—The Iowa Railway & Light Company is building a hydroelectric power plant, located at First Street, East Avenue and River, to cost about $90,000. The Fargo Engineering Company of Jackson, Mich., has charge of the engineering work.

CEDAR RAPIDS, IOWA—The Board of Railroad Commissioners have granted the Iowa Electric Company a franchise to erect and maintain an electric transmission line from Herndon to the towns of Guthrie Center, Menlo, Casey and Adair to supply electricity for lamps, heaters and motors in cities, towns and rural communities along the proposed line.

DELHI, IOWA—The Iowa Electric Company has been granted a franchise by the Board of Railroad Commissioners of Iowa to erect an electric transmission line from Delhi to Oneida and Worthington to supply electricity to cities, towns and rural communities along the proposed line.

FORT MADISON, IOWA.—The construction of an electric railway from Fort Madison to Keokuk via Nauvo, and probably to Quincy, Ill., is reported under consideration. J. M. Fisher of Nauvo is said to be interested in the project.

IOWA CITY, IOWA.—Bids will be received by A. J. Hertz, Secretary of School Board of the Independent School District of Iowa City, at the office of G. L. Lockhart, architect, 120½ East Washington Street, Iowa City, until Dec. 7 for construction of three school buildings. Separate bids to be submitted on general construction, heating and ventilating, electrical work, manual training and domestic science equipment, gymnasium equipment and seating for each building. Plans are on file at the office of the Secretary of the Board, Iowa City, and at the office of G. L. Lockhart, architect, Endicott Building, St. Paul, Minn.

LE MARS, IOWA—Steps have been taken to organize a company to install an electric lighting plant in Le Mars. A franchise has not yet been secured. C. E. Flaugher is interested.

PLYMOUTH, IOWA.—Bonds to the amount of $7,000 have been voted for the installation of an electric lighting system. It is proposed to erect an extension to the transmission line of the Peoples' Gas & Electric Company of Mason City.

WEBSTER CITY, IOWA.—Improvements are contemplated to the municipal electric-light and water plant, including the installation of a 500-kw. steam turbine, a 250-hp boiler and a Taylor stoker.

ATLANTA, MO.—A company has been organized to establish an electric-lighting system in Atlanta. Energy will be supplied by the municipal electric plant at Macon. C. F. Thudium is superintendent of the Macon plant.

KANSAS CITY, MO.—Plans are being prepared, it is reported, for the construction of a new power plant, to cost about $3,000,000, for the Kansas City Light & Power Company.

KENNETT, MO.—The property of the Missouri & Southeastern Utilities Company, consisting of six electric light and power plants at Caruthersville, Hayti and Kennett, in Missouri and Blytheville, Rector and Piggott, in Arkansas, has been purchased by John H. Watkins, of New York, N. Y.

KIRKWOOD, MO.—The Board of Aldermen has approved a recommendation for

improvements to the municipal electric-light plant, involving an expenditure of about $8,000.

ST. JOSEPH, MO.—Plans are being considered by the Park Board for securing electricity for lighting the boulevards of the city. It is proposed to use ornamental standards. The lamps for the ornamental lighting system will require alternating current; at present the municipal electric plant supplies only direct current. Conduits have already been laid along Noyes Boulevard and contracts were recently let for conduits and cable for Boulevard A.

SEDALIA, MO.—The Sedalia Light & Traction Company has petitioned the Public Service Commission for permission to issue $29,400 in securities, the proceeds to be used to reimburse the company for expenditures already made. Additional improvements are also contemplated by the company.

SHERIDAN, MO.—The installation of a municipal electric-light plant in Sheridan is under consideration.

SPRINGFIELD, MO.—At an election to be held Dec. 12 the proposal to issue $400,000 in bonds to establish a municipal electric-light plant will be submitted to the voters.

CALVIN, N. D.—The installation of an electric-lighting system in Calvin is under consideration. The cost is estimated at $3,500.

HARTFORD, S. D.—The Hartford Light & Power Company is extending its transmission lines to Colton and Huntimer Siding, a distance of 4 miles, to supply electrical service in those towns.

BERTRAND, NEB.—At an election held recently the proposal to issue $11,000 in bonds for the installation of an electric-lighting system was carried.

BERLIN, NEB.—Work has started on the construction of a garage and electric-light plant for W. H. Ireland of Berlin, to cost about $9,000. J. G. Gardner, 519 Bankers Life Building, Lincoln, Neb.

CORTLAND, NEB.—The Council has appointed a committee to secure estimates of cost of the installation of a municipal electric-light plant in Cortland.

HAVELOCK, NEB.—Bids will be received by the board of education of Havelock, until Dec. 8 for the construction of a high school building, including steam heating, electric wiring, etc., to cost about $75,000. W. F. Gernandt, Keeline Building, Omaha, is architect.

OMAHA, NEB.—The American Electric Company of Omaha, has been awarded the contract for the fire-alarm system at the new plant of Morris & Company at the south side; also the contract for the ornamental lighting at the new hospital on the University of Nebraska Medical College campus in Omaha.

HIAWATHA, KAN.—The installation of an additional Diesel engine to cost about $26,000, in the municipal electric-light plant is under consideration.

MULLINVILLE, KAN.—An election will soon be held to submit to the voters the proposal to issue bonds for the installation of a municipal electric-light plant. The City Council is considering a proposition submitted by the city of Greensburg to supply energy to operate the system.

MUNDEN, KAN.—Preliminary plans are being prepared for the construction of a municipal electric-light plant in Munden. The proposal to issue bonds for the proposed plant will be submitted to the voters on Dec. 1.

WICHITA, KAN.—Bids will be received by John T. Hessel, chairman of the county commissioners of Sedgwick County, Wichita, until Dec. 11 for the erection of the Sedgwick County Jail and attached residence, to be erected on the present court house site in Wichita. Separate bids to be submitted on heating apparatus, steel cell work, cooler, electric elevator, plumbing work, kitchen and laundry equipments.

Southern States

COMMERCE, GA.—The city of Commerce will receive bids until Dec. 4 for $10,000 5 per cent electric light bonds. C. A. Goodin, clerk and treasurer.

LAKE BUTLER, FLA.—Bonds to the amount of $10,000 have been voted for the installation of an electric-lighting plant.

MONROEVILLE, ALA.—A waterpower development on a creek, 3 or 4 miles from Monroeville, to supply electricity here and possibly to several other towns is under consideration. The cost is estimated at from $30,000 to $40,000. L. J. Bugg is interested.

LITTLE ROCK, ARK.—The Prairie Light & Development Company, recently incorporated with a capital stock of $500,000, proposes to supply electricity (primarily) for cotton gins, rice mills and rice pumping plants; also to erect transmission lines to transmit electricity from Little Rock to Lonoke, Carlisle, Hazen, Devall Bluff and vicinity; later transmission lines will probably be erected to Benton, Conway and England; distributing system will be erected in cities. The company will purchase energy from the Little Rock Railway & Electric Company. S. R. Morgan of Little Rock, Ark.; J. R. Perkins of St. Louis, Mo., and R. O. Lehn of Chicago, Ill., are among the incorporators.

ALEXANDRIA, LA.—The Chamber of Commerce is considering the question of establishing an ornamental lighting system on Second and Third Streets.

MARLOW, OKLA.—Bids will be received by the city clerk, City Hall, Marlow, until Dec. 4 for waterworks system as follows: One 250-hp. engine (this may be steam or may be of some other type of prime mover). If steam, then one boiler of sufficient size to supply the above engine, together with heater, pumps, valves, gages and all accessories for a complete installation; one 180-kva., 60-cycle, three-phase, 2300-volt alternator with exciter. The alternator may be directly connected or belted; one-panel switchboard, equipped with all instruments; one deep-well pump, capable of lifting 100 gal. per minute 300 ft., including all piping and connections; one motor to drive the above pump, one pump capable of supplying the mains 500 gal. per minute against a 200 ft. head, and one motor to operate the above pump; 19,000 ft. of 4-in. water pipe, fire hydrants, etc. Bids may be submitted on all or any part of the work. George T. Putty is mayor.

MORRISON, OKLA.—An election will soon be held to submit the proposal to appropriate $7,000 for the installation of an electric-lighting system and $18,000 for water-works to the voters.

OKMULGEE, OKLA.—The city of Okmulgee is asking for bids for the installation of an electrically-driven pump, directly connected, with a capacity of 1100 gal., together with 11,240 ft. of 10-in. pipe, and a 2300-volt, 60-cycle motor.

DALLAS, TEX.—The Dallas Southwestern Traction Company is planning to begin work soon on the construction of its proposed electric railway from Dallas to Eagle Ford. Later the railway will be extended to Grand Prairie and Cleburne.

D'HANNIS, TEX.—The installation of a municipal electric-lighting plant in D'Hannis is under consideration.

HOUSTON, TEX.—The Houston Lighting & Power Company, it is reported, contemplates enlarging its light and power plant.

LAREDO, TEXAS—August C. Richter of Laredo, it is reported, would like to receive estimates of cost for an electric-lighting plant with storage batteries for a $70,000 store building.

SAN ANTONIO, TEX.—A large amount of electrical equipment will be required for the motion picture suburb (to be called Gotham City) which the Gotham Film Corporation of New York, N. Y., is to build in San Antonio. The general contract for the construction of the proposed city has been awarded to J. P. McDonald of Austin, for $350,000.

Pacific States

CASHMERE, WASH.—The City Council is considering the proposal to create a bond issue of $50,000 to provide funds for the construction of a hydroelectric power plant on the Wenatchee River. Plans have been prepared for a plant to develop 1000 hp. O. M. Carter is superintendent of the water and light department.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company, and subsidiary companies, it is reported, contemplate an expenditure of $1,250,000 for improvements and extensions to their systems.

SEATTLE, WASH.—The City Council has passed an ordinance granting the Postal Telegrpah Cable Company a franchise to construct and operate underground conduits, cables, etc., and overhead wires for local and long distance telephone service.

SEATTLE, WASH.—The Commissioners of the Port of Seattle have decided to hold an election on Dec. 2 to vote on the proposal to issue $450,000 in bonds to construct a belt line along the water front, to connect various public docks, car shops, etc., at Spokane Street. G. L. Nicholson is chief engineer.

SEATTLE, WASH.—The City Council has passed an ordinance authorizing the purchase of all lots adjoining the present steam auxiliary steam power plant on Lake Union, to be used as a site for the erection of an addition to the present power house. It is proposed to double the present output of the plant.

SEATTLE, WASH.—The Nepage McKenney Company, Armour Building, Seattle, and also maintaining offices in Portland, Ore., has secured the contract for installing electric wiring in seven vessels under construction by the Willamette Iron & Steel Works of Portland, which will involve an expenditure of about $90,000. The company has also secured the contract for electrical work in connection with the new post office at Vancouver, Wash.

SUNNYSIDE, WASH.—The Town Council has granted the Pacific Power & Light Company of Portland, Ore., a 50-year franchise to construct and operate an electric-lighting system in Sunnyside. The present arc-lamp and street-lighting system will be replaced with tungsten lamps; 500-watt lamps to be used in the business district and 100-watt lamps in the residence section of the town.

PORTLAND, ORE.—C. E. Cleveland, principal of the Portland Boys' School of Trades, has announced his intention of installing a power plant designed especially for giving instruction in operative engineering, to enable the students to co-operate with outside agencies in testing mechanical appliances relating to electric and other power work.

ROSEBURG, ORE.—The contract for the electrical work in connection with the construction of the Roseburg High School (to cost $90,000) has been awarded to the Miller-Hall Electrical Company of Portland, Ore.

FRESNO, CAL.—The construction of an irrigation system, including motor-driven pumps, etc., for a 200-acre tract near Kings River, to cost about $100,000, is under consideration by Jefferson J. Graves and Walker C. Graves, Merchants National Bank Building, San Francisco.

SAN FRANCISCO, CAL.—Bids will be received at the office of the depot quartermaster, United States Army, San Francisco, Cal., until Dec. 8 for furnishing the following supplies: 100 lb. insulating tape, 50 lb. insulating tape, four switchboard ammeters, 30 lamp guards, one indicator, 24 battery jars, 144 battery parts, 20 parts for Vulcan ice machine, 144 parts for Vulcan ice machine, one voltmeter, one voltammeter, 200 ft. copper wire, 70 lb. friction tape, 58 lb. insulating tape, etc. For further information address Col. John T. Knight, department quartermaster.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has petitioned the Railroad Commission for permission to expend $2,250,000 for extensions and improvements to its system, of which the proceeds of $1,850,000 will be used for the construction of a hydroelectric plant on South Yuba River. The company is planning to expend about $225,000 in enlarging its irrigation system in Placer County, utilizing the water from Lake Spaulding after it has served to generate power. A high-tension transmission line to Stockton, 78 miles long, is being erected, giving the company a duplicate line. The company will take over the Oro Electric Corporation of Oroville Jan. 1.

SAN LUIS OBISPO, CAL.—Preparations are being made by the Midland Counties Public Service Corporation, controlled by the San Joaquin Light & Power Company of Fresno, for extension of its transmission lines in various parts of San Luis Obispo and Santa Barbara Counties. Arrangements, it is reported, have been made for erecting a branch line to Avila and later energy will be supplied to the towns of Morro, Caucos and Cambria. The San Joaquin company is reported to have appropriated $300,000 for additions to the service.

MACKAY, IDAHO—The Mackay Light & Power Company is contemplating extending its transmission line to Pioneer.

POCATELLO, IDAHO—The Pocatello Traction & Interurban Company of Pocatello is contemplating the construction of an electric railway from Preston to Yellowstone. C. G. Haynes of Blackfoot is interested.

COALVILLE, UTAH—The City Council has authorized the sale of the municipal electric-light plant to the Utah Power & Light Company of Salt Lake City, at $7,250. The Utah company will reconstruct the line through the city and connect it with its transmission line runing from Devil's Slide to Park City. The city has entered into a contract with the company for street-lighting.

SALT LAKE CITY, UTAH—The capital stock of the Utah Power & Light Company has been increased from $45,000,000 to $60,000,000. The company, it is reported, contemplates extensive developments, consist-

ing chiefly in furnishing energy to railroads and electric furnaces of iron smelters. The equipping of the Saltair railway for electrical operation next summer will call for a large power contract; the electrification of the Bingham & Garfield Railroad and the general operation of the Utah Copper Mine by electricity is under consideration.

SANTA FE, N. M.—Bids will be received at the office of the Rio Grande Light, Heat & Power Company, 119 South Fourth Street, Philadelphia, Pa., until Jan. 2, 1917, for furnishing material and labor necessary to construct a hydroelectric development located at the mouth of the White Rock Canyon of the Rio Grande in New Mexico. The site is located about 20 miles west of Santa Fe and approximately 46 miles north of Albuquerque. The project consists of building a hollow concrete dam, maximum height 155 ft., and total length 625 ft. Power house to be located on downstream side of the dam, 160 ft. by 54 ft.; penstocks 8 ft. in diameter. The initial installation will consist of two 5000-hp. units, ultimately five. Copies of plans and specifications may be obtained from A. G. Hillberg, engineer, Park Row Building, New York, N. Y., upon deposit of $25. Bids are to be addressed to Charles G. Wilfong, president of the Rio Grande Light, Heat & Power Company, 119 South Fourth Street, Philadelphia, Pa.

Canada

TORONTO, ONT.—Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, has announced that the right of way for a canal to be constructed between Lake Erie and the Niagara Gorge (in connection with the Chippewa-Niagara Falls power development) to create a new fall at which power will be generated, has been acquired by the commission. Contracts will be awarded for the work this winter and work will begin as early as possible in the spring. W. W. Pope, 190 University Avenue, Toronto, is secretary of the commission.

1,204,395. ALTERNATING-CURRENT RECTIFIER; Donald M. Bliss, West Orange, N. J. App. filed Aug. 21, 1911. Means for utilizing both half waves of alternating current.

1,204,398. ELECTRODEPOSITION OF METAL ON ROTATION-BODIES; Heinrich Wilhelm, Ludwigshafen, On-the-Rhine, Germany. App. filed July 14, 1913. For zincing the fellies or rims of wheels.

1,204,407. PROTECTIVE MEANS FOR TRANSMISSION-LINES; George J. D. Centerwall, Stockholm, Sweden. App. filed April 19, 1912. Prevent momentary excessive voltages and disturbances.

1,204,411. VAPOR-RECTIFIER; Frank Conrad, Swissvale, and Karl A. Simmon, Wilkinsburg, Pa. App. filed July 11, 1914. Used in connection with vehicles of electric railways.

1,204,412. CABLE-TERMINAL; Frank B. Cook, Chicago, Ill. App. filed Aug. 11, 1913. Means for distributing the various conductors of the cables.

1,204,420. SOUND-BOX; Thomas A. Edison, Llewellyn Park, West Orange, N. J. App. filed March 24, 1911. Giving an improved quality of reproduction by the elimination of minute scratch vibrations.

1,204,432. CONTROL SYSTEM FOR ELECTRIC MOTORS; Arthur J. Hail and Lynn G. Riley, Wilkinsburg, Pa. App. filed Oct. 23, 1913. For use in electric railways and similar vehicles.

1,204,435. COMBINED CIRCUIT-BREAKER AND SWITCH; Frank O. Hartman, Mansfield, Ohio. App. filed March 4, 1915. Especially adapted for automobile use.

1,204,452. FRAUD-PREVENTIVE DEVICE FOR VENDING-MACHINE; Elias H. Kelley, New York, N. Y. App. filed Dec. 17, 1909. For vending machines of the coin-controlled type.

1,204,456. INCANDESCENT LAMP; Arthur S. Knight, Newark, N. J. App. filed May 13, 1909. Supporting means for the filaments.

1,204,463. ELECTRIC-RAILWAY SYSTEM; Paul W. Leffler, Chicago, Ill. App. filed Aug. 13, 1908. Means for transmitting current to the cars, in electric railway systems.

1,204,469. ELECTROMAGNETIC RELAY; Victor E. Middlekauff, Hagerstown, Md. App. filed Jan. 23, 1915. Adapted for use in combination with an electrically coupled pipe organ.

1,204,471. WHEEL-BRAKE; Chester B. Mills, East McKeesport, and John P. Nikonow, Pittsburgh, Pa. Used in connection with elevators, hoists and rolling mills.

1,204,481. SECONDARY OR STORAGE BATTERY; Charles W. Norton, West Orange, N. J. App. filed Aug. 13, 1914. Improved mechanical details in construction.

1,204,486. ELECTRICAL PROTECTIVE DEVICE; Karl C. Randall, Edgewood Park, Pa. App. filed Dec. 2, 1915. Trip-coil mechanisms that are employed to trip circuit interrupters.

1,204,489. MEASURING MAGNETIC PROPERTIES OF MATERIALS AND APPARATUS THEREFOR; Walter Bogowski, Berlin-Charlottenburg, Germany. App. filed Aug. 5, 1913. For determining the ampere-turns necessary for magnetizing any magnetizable part of electric machines.

1,204,507. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, and Paul MacGahon, Pittsburgh, Pa. App. filed Nov. 28, 1913. Adapted to trip a circuit interrupter.

1,204,508. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, Pa. App. filed July 11, 1914. Simple and economical relay mechanism.

1,204,510. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, Pa. App. filed Dec. 29, 1914. Operates correctly upon any value of overload.

1,204,513. BURGLAR-ALARM; James W. Smith, Brooklyn, N. Y. App. filed Aug. 20, 1915. Connection with a door knob.

1,204,539. AUTOMOBILE SPEED-SIGNAL; Albert O. Benson, Ary A. Benson, Guy Mirl Benson, Haldor K. Solberg, all of Seattle, and Charles H. Flick, of Ellensburg, Wash. App. filed March 10, 1915. Improvements in speed indicating devices for motor vehicles.

Record of Electrical Patents

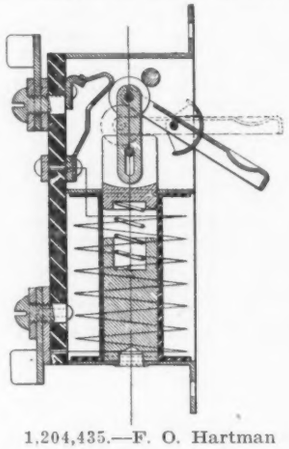
Notes on United States Patents issued on Nov. 11, 1916.

1,204,540. TROLLEY-WIRE HANGER; Glenn Henry Bolus, Mansfield, Ohio. App. filed May 12, 1916. Improvements in suspension devices for trolley wires.

1,204,573. ELECTRIC IGNITER FOR EXPLOSIVE-ENGINES; Edmund Joseph Kane, Chicago, Ill. App. filed Feb. 2, 1910. Means for producing the spark for firing the charge.

1,204,591. SIGNALING DEVICE; Leadore I. Randall, Lincoln, Neb. App. filed Jan. 7, 1916. Adapted for use in connection with vehicles.

1,204,599. ELECTRIC SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed June 19, 1912. Adapted for use in isolated places.



1,204,435.—F. O. Hartman

1,204,600. ELECTRIC SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed July 13, 1912. For use in isolated places.

1,204,601. ELECTRIC SYSTEM; Frank M. Slough, Elyria, Ohio. App. filed Nov. 27, 1912. Adapted for use in isolated places.

1,204,606. STEERING-COLUMN SWITCH; Jason C. Stearns, Worcester, Mass. App. filed July 22, 1915. Designed for use on automobiles.

1,204,625. BUSHING FOR ELECTRIC TUBULAR INSULATION; Carl M. Wheelock, Milwaukee, Wis. App. filed April 4, 1913. Means for securely attaching the tubing to the edges of openings such as those in cutout boxes.

1,204,628. LIGHTNING-ARRESTER; Wilber Meads Wilson and Willie Reid McCrackie, Bryson City, N. C. App. filed March 24, 1916. Designed for telephones.

1,204,653. INCANDESCENT LAMP; John H. Dale, New York, N. Y. App. filed Jan. 20, 1915. Provision of a ventilated lamp bulb.

1,204,669. PROCESS FOR AGING WINE; Arthur Lachman, Berkeley, Cal. App. filed July 28, 1913. Subjects the wine to heat pressure electrically, either simultaneously or consecutively.

1,204,691. CLIP; Joseph Sachs, Hartford, Conn. App. filed Sept. 20, 1915. Of particular advantage when incorporated in a cut-out.

1,204,731. CONTROL-WIRING FOR ELECTRIC HEATING DEVICES; Thaddeus F. Baily and Frank T. Cope, Alliance, Ohio. App. filed Feb. 21, 1916. Electrically controls the temperature of a furnace.

1,204,732. ADVERTISING-CLOCK; Eugene Banta, William John Merritt and Henry Joseph Lippe, Jr., of New York, N. Y. App. filed July 8, 1914. Self-winding type and one that is provided with a marine or hair-spring escapement.

1,204,740. CURRENT-CONVERTING DEVICE; Arthur R. Bullock, Cleveland, Ohio. App. filed Aug. 18, 1913. Operated with practically no sparking.

1,204,745. PRESSURE-DIE FOR INSULATOR-PRESSING MOLDS; Jens Peter Dahl-Jensen, Copenhagen, Denmark. App. filed Oct. 13, 1915. For making insulators or similar objects, for screw holes and bell rims.

1,204,749. ELECTRICAL COIL AND METHOD OF WINDING SAME; Ernest A. DeWolfe, Mansfield, Mass. App. filed May 28, 1915. An improved method of winding.

1,204,759. TIME-VALVE AND CIRCUIT-BREAKER; Gardner B. Gray, Pittsburgh, Pa. App. filed Nov. 1, 1911. Provision of a time valve connected with the service application of an air-brake system.

1,204,817. POLYPHASE REACTANCE-COIL; John F. Peters, Edgewood Park, Pa. App. filed Oct. 3, 1914. To limit to safe values the abnormal current flow.

1,204,825. DOUBLE-SERVICE ELECTRIC GENERATOR AND SUPPLY SYSTEM; Joseph Sachs, Hartford, Conn. App. filed May 23, 1911. Supplies a low-tension current for use in the operation of translating or current-receiving devices such as lights.

1,204,826. SUBMARINE SIGNALING APPARATUS; Josef Schiessler, Baden, near Vienna. App. filed Feb. 8, 1908. Improved submarine signaling apparatus.

1,204,835. RELAY; Alfred A. Ziegler, Boston, Mass. App. filed May 22, 1915. Used in connection with railway signaling apparatus.

1,204,857. APPARATUS FOR CONTROLLING THE VOLTAGE IN VARIABLE-SPEED ILLUMINATING DYNAMOS; Ernest Fuchs, Billancourt, France. App. filed Jan. 6, 1915. Particularly for the illumination of automobile vehicles.

1,204,909. THERMOSTATIC HEAT-REGULATOR; Howell W. Souder and Robert H. Douder, Tamaqua, Pa. App. filed May 4, 1916. Buildings or other structures.

1,204,998. RAILWAY SIGNALING; Ronald A. McCann, New Brunswick, N. J. App. filed Feb. 7, 1914. Signaling for stretches of single track over which traffic moves in both directions.

1,205,002. PROCESS OF EXHAUSTING LAMPS; John T. Marshall, Metuchen, N. J. App. filed Oct. 23, 1911. Exhausting incandescent lamp.

1,205,010. IGNITION APPARATUS; Carl E. Pearson, Lansing, Mich. App. filed April 27, 1914. For internal combustion engines.

1,205,051. AUTOMOBILE-LOCK; Leon Sculliere, Detroit, Mich. App. filed Aug. 7, 1916. Control the fuel supply of the automobile.

1,205,080. PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS; Fritz Baumann, Augsburg, Germany. App. filed March 8, 1913. Containing small admixtures of metals.

1,205,136. TIMER FOR INTERNAL-COMBUSTION ENGINES; Clifton R. Holmes, California, Mich. App. filed Feb. 17, 1916. Provides a simply constructed and inexpensive device.

1,205,098. SIGNAL FOR AUTOMOBILES; Harold B. McGuire, Fort Wayne, Ind. App. filed April 2, 1915. Contrived to designate the intended course over which the automobile is to be driven.